

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

43

UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY



BOOK NUMBER

1

Ex 6 R

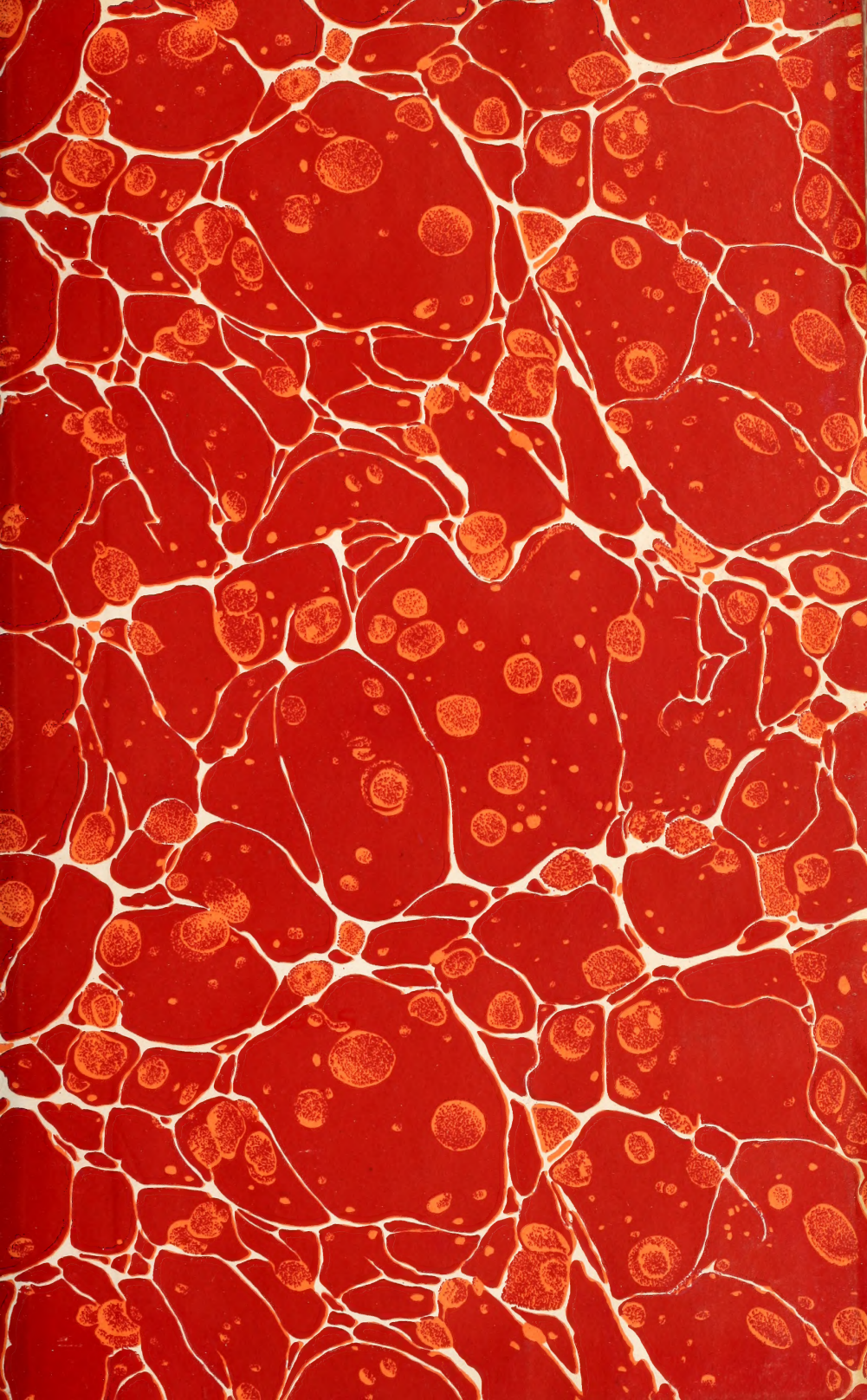
72

~~Reg. 111~~

Jan.-June 1935

GPO 8-7671

266293

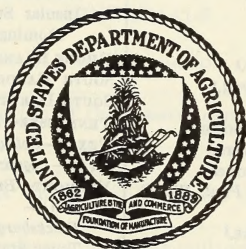


UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

5312-14 57661
agc
312-14

EXPERIMENT STATION RECORD

VOLUME 72
JANUARY-JUNE 1935



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1935

U. S. DEPARTMENT OF AGRICULTURE

SECRETARY—Henry A. Wallace

UNDER SECRETARY—Rexford G. Tugwell

ASSISTANT SECRETARY—Milburn L. Wilson

OFFICE OF EXPERIMENT STATIONS—James T. Jardine, *Chief*

THE AGRICULTURAL EXPERIMENT STATIONS

- ALABAMA—*Auburn*: M. J. Funchess.¹
ALASKA—*College*: G. W. Gasser.¹
ARIZONA—*Tucson*: P. S. Burgess.¹
ARKANSAS—*Fayetteville*: D. T. Gray.¹
CALIFORNIA—*Berkeley*: O. B. Hutchison.¹
COLORADO—*Fort Collins*: E. P. Sandsten.¹
CONNECTICUT—
 [New Haven] Station: *New Haven*; } W. L. Slate.¹
 Storrs Station: *Storrs*;
DELAWARE—*Newark*: C. A. McCue.¹
FLORIDA—*Gainesville*: W. Newell.¹
GEORGIA—
 Experiment: H. P. Stuckey.¹
 Coastal Plain Station: *Tifton*: S. H. Starr.¹
HAWAII—*Honolulu*: O. C. Magistad.¹
IDAHO—*Moscow*: E. J. Iddings.¹
ILLINOIS—*Urbana*: H. W. Mumford.¹
INDIANA—*La Fayette*: J. H. Skinner.¹
IOWA—*Ames*: R. E. Buchanan.¹
KANSAS—*Manhattan*: L. E. Call.¹
KENTUCKY—*Lexington*: T. P. Cooper.¹
LOUISIANA—*Baton Rouge*: O. T. Dowell.¹
MAINE—*Orono*: F. Griffee.¹
MARYLAND—*College Park*: H. J. Patterson.¹
MASSACHUSETTS—*Amherst*: F. J. Sievers.¹
MICHIGAN—*East Lansing*: V. R. Gardner.¹
MINNESOTA—*University Farm, St. Paul*: W. C. Coffey.¹
MISSISSIPPI—*State College*: J. R. Ricks.¹
MISSOURI—
 College Station: *Columbia*; F. B. Mumford.¹
 Fruit Station: *Mountain Grove*; P. H. Shepard.¹
 Poultry Station: *Mountain Grove*; T. W. Noland.¹
MONTANA—*Bozeman*: F. B. Linfield.¹
NEBRASKA—*Lincoln*: W. W. Burr.¹
NEVADA—*Reno*: S. B. Doten.¹
NEW HAMPSHIRE—*Durham*: J. C. Kendall.¹
NEW JERSEY—*New Brunswick*: J. G. Lipman.¹
NEW MEXICO—*State College*: Fabian Garcia.¹
NEW YORK—
 State Station: *Geneva*; U. P. Hedrick.¹
 Cornell Station: *Ithaca*; C. E. Ladd.¹
NORTH CAROLINA—*State College Station, Raleigh*: R. Y. Winters.¹
NORTH DAKOTA—*State College Station, Fargo*: H. L. Walster.¹
OHIO—*Wooster*: C. G. Williams.¹
OKLAHOMA—*Stillwater*: C. P. Blackwell.¹
OREGON—*Corvallis*: W. A. Schoenfeld.¹
PENNSYLVANIA—*State College*: R. L. Watts.¹
PUERTO RICO—
 Federal Station: *Mayaguez*; Atherton Lee.¹
 Insular Station: *Rio Piedras*; F. A. Lopez Dominguez.¹
RHODE ISLAND—*Kingston*: G. E. Adams.¹
SOUTH CAROLINA—*Clemson*; R. A. McGinty.²
SOUTH DAKOTA—*Brookings*: J. W. Wilson.¹
TENNESSEE—*Knoxville*: O. A. Mooers.¹
TEXAS—*College Station*: A. B. Conner.¹
UTAH—*Logan*: ———.
VERMONT—*Burlington*: J. L. Hills.¹
VIRGINIA—
 Blacksburg: A. W. Drinkard, Jr.¹
 Truck Station: *Norfolk*; H. H. Zimmerley.¹
WASHINGTON—
 College Station: *Pullman*; E. C. Johnson.¹
 Western Station: *Puyallup*; J. W. Kalkus.³
WEST VIRGINIA—*Morgantown*: F. D. Fromme.¹
WISCONSIN—*Madison*: C. L. Christensen.¹
WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting director.

³ Superintendent.

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment—
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 72

EDITORIALS

	Page
The forty-eighth convention of the Association of Land-Grant Colleges and Universities.....	1
Research at the 1934 convention of the Association of Land-Grant Colleges and Universities.....	145
Theobald Smith (1859-1934).....	289
Abram Winegardner Harris (1858-1935), second director of the Office of Experiment Stations.....	433
Recent progress in the coordination of agricultural research.....	577
The establishment of the Soil Conservation Service.....	737

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION:

Bulletin 242.....	862
Bulletin 243.....	760
Leaflets 8-10.....	358
Leaflet 11.....	323
Leaflet 12.....	343
Leaflet 13.....	828

ARIZONA STATION :		Page
Bulletin 148	-----	346
Technical Bulletin 54	-----	763
ARKANSAS STATION :		
Bulletin 311	-----	712
Bulletin 312 (Forty-sixth Annual Report, 1934)	-----	739,
743, 756, 768, 784, 786, 806, 821, 830, 845, 846, 861, 883, 885,		894
Bulletin 313	-----	864
Bulletin 314	-----	863
CALIFORNIA STATION :		
Bulletin 569 (Supplement, 1934)	-----	410
Bulletin 576	-----	191
Bulletin 577	-----	263
Bulletin 578	-----	373
Bulletin 579	-----	360
Bulletin 580	-----	115
Bulletin 581	-----	402
Bulletin 582	-----	272
Bulletin 583	-----	226
Bulletin 584	-----	545
Circular 334	-----	14, 34, 46
Circular 335	-----	400
Hilgardia, volume 8—		
No. 8, September 1934	-----	348
No. 9, September 1934	-----	374
No. 10, October 1934	-----	647
An Analysis of the Operations of the Hayward Poultry Producers' Association, J. M. Tinley and J. B. Schneider	-----	405
Barley Statistics with Special Reference to California, J. B. Schneider and D. W. Smythe	-----	410
Control and Prevention of the Western Subterranean Termite, W. B. Herms	-----	506
Cost of Producing Queen and Package Bees in California, R. L. Adams and F. E. Todd	-----	405
Egg Statistics Relating to the Southern Counties of California, E. C. Voorhies and J. B. Schneider	-----	410
Monthly Prices of Selected California Truck Crops on the San Francisco, Oakland, Los Angeles, and New York City Markets, 1910-1934, H. J. Stover and A. W. Stuart	-----	860
New Facts for California Farmers, C. B. Hutchison [Biennial Report 1933-34]	-----	589, 606, 616, 634, 654, 671, 680, 689, 700, 719, 735
Poultry Statistics Relating to the Southern Counties of California, E. C. Voorhies	-----	410
Rural Tax Delinquencies in California, G. M. Peterson	-----	412
COLORADO STATION :		
Bulletin 357, rev	-----	476
Bulletin 412	-----	177
Bulletin 413	-----	558
Technical Bulletin 9	-----	275
Technical Bulletin 10	-----	518
Technical Bulletin 11	-----	767
Press Bulletin 82	-----	674

COLORADO STATION—Continued.		Page
Press Bulletin 83.....		675
Forty-seventh Annual Report, 1934.....		743,
	757, 768, 787, 806, 821, 837, 846, 854, 894	
CONNECTICUT [NEW HAVEN] STATION :		
Bulletin 361 (Supplement)		771
Bulletin 363.....		130
Bulletin 364.....		324
Bulletin 365.....		592
Fifty-seventh Report, 1933.....		429
[CONNECTICUT] STORRS STATION :		
Bulletin 194.....		127
Bulletin 195.....		256
Bulletin 196.....		412
DELAWARE STATION :		
Bulletin 190.....		551
Bulletin 191.....		555
FLORIDA STATION :		
Bulletin 266.....		120
Bulletin 267.....		353
Bulletin 268.....		5
Bulletin 269.....		467
Bulletin 270.....		485
Bulletin 271.....		813
Bulletin 272.....		779
Annual Report, 1933.....	298, 316, 326, 346, 358, 371, 376, 385, 393, 413,	429
GEORGIA STATION :		
Bulletin 182.....		38
Bulletin 183.....		93
Bulletin 184.....		372
Bulletin 185.....		779
Bulletin 186.....		801
Circular 103.....		765
Circular 104.....		774
GEORGIA COASTAL PLAIN STATION :		
Bulletin 23.....		761
Bulletin 24 (Fourteenth Annual Report, 1933-34) ..	743, 757, 768, 787, 825,	894
HAWAII STATION :		
Bulletin 71.....		191
Bulletin 72.....		469
Circular 9.....		182
Animal Husbandry Division Progress Notes No. 7.....		373
Animal Husbandry Division Progress Notes No. 8.....		831
Report, 1933.....	298, 316, 327, 371, 376, 391, 413,	429
HAWAIIAN SUGAR PLANTERS' STATION :		
Hawaiian Planters' Record, volume 38—		
No. 3, 1934.....	304, 305, 308,	357
No. 4, 1934.....		816
[HAWAIIAN] PINEAPPLE PRODUCERS' STATION :		
Bulletin 14.....		11
Bulletin 15.....		84

IDAHO STATION :

	Page
Bulletin 203.....	117
Bulletin 204.....	114
Bulletin 205 (Annual Report, 1933).....	13,
	34, 46, 60, 74, 87, 95, 102, 110, 118, 137, 141
Bulletin 206.....	97
Bulletin 207.....	401
Bulletin 208.....	861
Bulletin 209.....	825
Circular 73.....	142

ILLINOIS STATION :

Bulletin 405.....	24
Bulletin 406.....	285
Bulletin 407.....	687
Bulletin 408 and abs.....	858
Bulletin 409.....	783
Bulletin 410.....	776
Circular 422 (Supplement).....	559
Circular 424.....	91
Circular 425.....	115
Circular 426.....	709
Circular 427.....	778

INDIANA STATION :

Circular 201.....	88
Circular 202.....	25
Circular 203.....	13, 35, 46, 90, 141
Circular 204.....	303

IOWA STATION :

Bulletin 316.....	124
Bulletin 317.....	124
Bulletin 318.....	119
Bulletin 319.....	121
Bulletin 320.....	121
Bulletin 321.....	555
Bulletin 322.....	544
Bulletin 323.....	709
Research Bulletin 172.....	92
Research Bulletin 173.....	19
Research Bulletin 174.....	557
Report, 1934.....	739, 743, 755, 757, 768,
	784, 787, 804, 806, 821, 830, 843, 846, 854, 863, 864, 866, 893, 894

KENTUCKY STATION :

Bulletin 336.....	25
Bulletin 350.....	129
Bulletin 351.....	556
Bulletin 352.....	711
Circular 42.....	512
Circular 43.....	455
Regulatory Series No. 4.....	474
Regulatory Series No. 5.....	517
Forty-fifth Annual Report, 1932, part 2.....	894
Forty-sixth Annual Report, 1933, part 1.....	8,
	13, 35, 47, 60, 74, 88, 95, 102, 118, 142

LOUISIANA STATION :

Page

Bulletin 249	89
Bulletin 250	69
Bulletin 251	49
Bulletin 252	68
Bulletin 253	115
Bulletin 254	322
Bulletin 255	603
Bulletin 256	766
Bulletin 257	826
Bulletin 258	771
Bulletin 259	763
Bulletin 260	771
Circular 9	96
Circular 10	97
Circular 11	41
Circular 12	91
Circular 13	94

MAINE STATION :

Bulletin 371	139
Bulletin 372	425
Bulletin 373	406
Bulletin 374	406
Official Inspections 151	414
Official Inspections 152	372
Official Inspections 153	592

MARYLAND STATION :

Bulletin 361	40
Bulletin 362	13, 36, 37, 38, 45, 46, 110, 142
Bulletin 363	43
Bulletin 364	507

MASSACHUSETTS STATION :

Bulletin 310	314
Bulletin 311	259
Bulletin 312	519
Bulletin 313	521
Bulletin 314	527
Control Series Bulletin 73	538
Meteorological Series Bulletins 547-548, July-August 1934	160
Meteorological Series Bulletins 549-550, September-October 1934	448
Meteorological Series Bulletins 551-552, November-December 1934	742

MICHIGAN STATION :

Special Bulletin 248	161
Special Bulletin 249	328
Special Bulletin 250	405
Special Bulletin 251	428
Special Bulletin 252	482
Special Bulletin 253	827
Technical Bulletin 139	124
Technical Bulletin 140	157
Technical Bulletin 141	750
Circular 152	482

MICHIGAN STATION—Continued.

	Page
Circular 153	712
Quarterly Bulletin, volume 17—	
No. 1, August 1934.....	174, 175, 224, 236, 243, 246, 255, 263, 269, 286
No. 2, November 1934.....	482, 502, 506, 521, 533

MINNESOTA STATION :

Bulletin 307	403
Bulletin 308	694
Bulletin 309	713
Bulletin 310	684
Bulletin 311	714
Technical Bulletin 97.....	380
Technical Bulletin 98.....	392
Technical Bulletin 99.....	458
Technical Bulletin 100.....	623
Technical Bulletin 101.....	393

MISSISSIPPI STATION :

Bulletin 303	174
--------------------	-----

MISSOURI STATION :

Bulletin 337	122
Bulletin 338	95
Bulletin 339	33
Bulletin 340 (Annual Report, 1933).....	448,
456, 464, 466, 476, 488, 501, 514, 525, 528, 539, 547, 560, 564, 573, 574	
Bulletin 341	519
Bulletin 342	808
Bulletin 343	776
Bulletin 344	832
Bulletin 345	840
Research Bulletin 206.....	172
Research Bulletin 207.....	33
Research Bulletin 208.....	85
Research Bulletin 209.....	85
Research Bulletin 210.....	17
Research Bulletin 211.....	99
Research Bulletin 212.....	17
Research Bulletin 213.....	247
Research Bulletin 214.....	247
Research Bulletin 215.....	248
Research Bulletin 216.....	248
Research Bulletin 217.....	463
Research Bulletin 218.....	550
Research Bulletin 219.....	522
Research Bulletin 220.....	823
Circular 179.....	101
Circular 180.....	101
Circular 181.....	774
Circular 182.....	821

MONTANA STATION :

Bulletin 290.....	268
Bulletin 291.....	160
Bulletin 292.....	184

MONTANA STATION—Continued.

Page

Bulletin 293.....	681
Bulletin 294.....	807
Circular 144.....	693
Circular 145.....	825
Fortieth Annual Report, 1933.....	894

NEBRASKA STATION:

Bulletin 287.....	45
Bulletin 288.....	45
Bulletin 289.....	851
Bulletin 290.....	843
Bulletin 291.....	848
Research Bulletin 72.....	549
Research Bulletin 73.....	97
Research Bulletin 74.....	94
Forty-seventh Annual Report, [1933].....	739,

743, 758, 769, 788, 822, 830, 837, 846, 894

NEW HAMPSHIRE STATION:

Bulletin 281.....	517
Technical Bulletin 60.....	504
Circular 46.....	546
Scientific Contribution 41.....	476
Scientific Contribution 42.....	336
[Scientific Contribution] 43.....	337
Scientific Contribution 44.....	337
Scientific Contribution 45.....	475

NEW JERSEY STATIONS:

Bulletin 569.....	14
Bulletin 570.....	26
Bulletin 571.....	21
Bulletin 572.....	98
Bulletin 573.....	89
Bulletin 574.....	69
Bulletin 575.....	124
Bulletin 576.....	75
Bulletin 577.....	617
Bulletin 578.....	592
Bulletin 579.....	660
Circular 317.....	84
Circular 318.....	117
Circular 319.....	90
Circular 320.....	74
Circular 321.....	74
Circular 322.....	73
Circular 323.....	74
Circular 324.....	74
Circular 325.....	74
Circular 326.....	74
Circular 327.....	209
Circular 328.....	74
Circular 329.....	74
Circular 330.....	319
Circular 331.....	304

NEW JERSEY STATIONS—Continued.

Page

Circular 332.....	561
Circular 333.....	506
Circular 334.....	513
Circular 335.....	591
Circular 336.....	700
Circular 337.....	616
Hints to Poultrymen, volume 21—	
No. 3, February–March 1934.....	91
No. 4, April–May 1934.....	241
No. 5, June–July 1934.....	374
No. 6, August–September 1934.....	521
New Jersey Agriculture, volume 16, No. 6, November–December 1934.....	801
Biennial Report, 1932–33..... 14, 26, 35, 47, 52, 60, 73, 74, 75, 88, 95, 107, 110, 142	

NEW MEXICO STATION :

Bulletin 220.....	39
Bulletin 221.....	93
Bulletin 222.....	90
Bulletin 223.....	207
Bulletin 224.....	553
Bulletin 225.....	408
Bulletin 226.....	832
Bulletin 227.....	234

[NEW YORK] CORNELL STATION :

Bulletin 596.....	270
Bulletin 597.....	408
Bulletin 598.....	411
Bulletin 599.....	51
Bulletin 600.....	15, 37
Bulletin 601.....	42
Bulletin 602.....	51
Bulletin 603.....	106
Bulletin 604.....	52
Bulletin 605.....	54
Bulletin 606.....	99
Bulletin 607.....	128
Bulletin 608.....	129
Bulletin 609.....	15, 744
Bulletin 610.....	562
Bulletin 611.....	476
Bulletin 612.....	303, 318
Bulletin 613.....	709
Bulletin 614.....	717
Bulletin 615.....	733
Bulletin 616.....	651
Memoir 157.....	199
Memoir 158.....	208
Memoir 159.....	195
Memoir 160.....	118
Memoir 161.....	49
Memoir 163.....	50
Memoir 164.....	510
Memoir 165.....	785

[NEW YORK] CORNELL STATION—Continued.

	Page
Memoir 166.....	300
Memoir 167.....	307
Memoir 168.....	322
Memoir 169.....	457
Forty-seventh Annual Report, 1934.....	756,
	758, 770, 773, 782, 784, 788, 807, 822, 830, 846, 855, 894

NEW YORK STATE STATION:

Bulletin 645.....	376
Bulletin 646.....	335
Bulletin 647.....	336
Bulletin 648.....	367
Bulletin 649.....	773
Bulletin 650.....	791
Technical Bulletin 224.....	379
Circular 145.....	53
Circular 146.....	53
Circular 147.....	105
Circular 148.....	158
Circular 149.....	158
Circular 150.....	329
Circular 151.....	477
Circular 152.....	477
Circular 153.....	624
Circular 154.....	616
Circular 155.....	684
The Vegetables of New York, volume 1, part 3: Sweet Corn, W. T. Tapley, W. D. Enzie, and G. P. Van Eseltine.....	329
Farm Research, volume 1—	
No. 1, October 1, 1934.....	297, 330, 333, 336, 360, 386, 429
No. 2, January 1, 1935.....	591,

617, 627, 635, 638, 639, 652, 665, 667, 680, 719

Fifty-third Annual Report, 1934.....	581, 589, 597, 616, 634, 654, 682, 693, 735
--------------------------------------	---

NORTH CAROLINA STATION:

Bulletin 289.....	124
Bulletin 297.....	66
Bulletin 298.....	273
Technical Bulletin 46.....	65
Agronomy Information Circular 87.....	43
Agronomy Information Circular [88].....	304
Agronomy Information Circular 89.....	304
Agronomy Information Circular 90.....	449

NORTH DAKOTA STATION:

Bulletin 277.....	326
-------------------	-----

OHIO STATION:

Bulletin 535.....	48
Bulletin 536.....	122
Bulletin 537.....	221
Bulletin 538.....	36, 96
Bulletin 539.....	208
Bulletin 540.....	608

OHIO STATION—Continued.

	Page
Bulletin 541.....	621
Bulletin 542.....	716
Bulletin 543.....	608
Bulletin 544.....	742
Bimonthly Bulletin 170.....	197, 198, 218, 233, 241, 272
Bimonthly Bulletin 171.....	486, 490, 521, 546, 547
Bimonthly Bulletin 172.....	765, 790, 801, 828, 829, 857, 861, 893
Special Circular 45.....	40, 47
Forest News, No. 24, September 1934.....	195

OKLAHOMA STATION:

Bulletin 219.....	553
Bulletin 220.....	517
Bulletin 221.....	715
Bulletin 222.....	818
Current Farm Economics, volume 7—	
No. 5, October 1934.....	401
No. 6, December 1934.....	684, 707

[OKLAHOMA] PANHANDLE STATION:

Panhandle Bulletin 55.....	618, 628
----------------------------	----------

OREGON STATION:

Bulletin 292.....	404
Bulletin 322.....	73
Bulletin 323.....	72
Bulletin 325.....	24

PENNSYLVANIA STATION:

Bulletin 303.....	373
Bulletin 307.....	91
Bulletin 308 (Forty-seventh Annual Report, 1934).....	743,
755, 764, 769, 776, 785, 788, 807, 823, 831, 846, 855, 857, 858, 868, 879, 894	
Technical Paper 569.....	858
Technical Paper 595.....	857
Technical Paper 601.....	861
Technical Paper 614.....	858
Technical Paper 615.....	858
Technical Paper 641.....	858

PUERTO RICO STATION:

Bulletin 35.....	179
Bulletin 36.....	531
Agricultural Notes No. 67.....	324
Agricultural Notes No. 68.....	471

PUERTO RICO DEPARTMENT OF AGRICULTURE AND COMMERCE STATION:

Annual Report, 1933 (Spanish edition)---	150, 174, 182, 195, 216, 233, 261, 286
--	--

PUERTO RICO INSULAR STATION:

Circular 103 (Spanish edition).....	666
-------------------------------------	-----

RHODE ISLAND STATION:

Bulletin 245.....	317
Bulletin 246.....	27
Annual Feed Circular, 1934.....	89
Annual Fertilizer Circular, 1934.....	456

SOUTH CAROLINA STATION:

	Page
Bulletin 296.....	129
Bulletin 297.....	25
Bulletin 298.....	270
Bulletin 299.....	573
Forty-seventh Annual Report, 1934.....	744,
	758, 769, 789, 807, 823, 831, 855, 870, 894

SOUTH DAKOTA STATION:

Bulletin 285.....	178
Bulletin 286.....	125
Bulletin 287.....	92
Bulletin 288.....	79
Circular 19.....	268
Circular 20.....	268
Circular 21.....	269

TENNESSEE STATION:

Bulletin 153.....	407
Circular 49.....	469
Circular 50.....	802

TEXAS STATION:

Bulletin 491.....	136
Bulletin 492.....	236
Bulletin 493.....	238
Bulletin 494.....	176
Bulletin 495.....	244
Bulletin 496.....	470
Bulletin 497.....	554
Bulletin 498.....	592
Circular 72.....	328

UTAH STATION:

Bulletin 249.....	127
Bulletin 250 (Biennial Report, 1933-34).....	298,
	316, 327, 347, 359, 371, 382, 393, 413, 428, 429
Bulletin 251.....	622
Bulletin 252.....	700
Circular 106.....	111

VERMONT STATION:

Bulletin 370.....	120
Bulletin 371.....	24
Bulletin 372.....	89
Bulletin 373.....	15
Bulletin 374.....	100
Bulletin 375.....	140
Bulletin 376.....	123
Bulletin 377.....	100
Bulletin 378.....	31
Bulletin 379.....	56
Bulletin 380 (Forty-seventh Annual Report, 1934).....	55, 95, 110, 142
Bulletin 381.....	25
Bulletin 382.....	838
Bulletin 383.....	306

VERMONT STATION—Continued.

Page

Bulletin 384.....	474
Bulletin 385.....	673
Circular 15.....	429

VIRGINIA STATION:

Bulletin 294.....	223
Bulletin 295.....	274

WASHINGTON STATION:

Bulletin 296.....	473
Bulletin 297.....	122
Bulletin 298.....	67
Bulletin 299.....	92
Bulletin 300.....	119
Bulletin 301.....	708
Bulletin 302.....	89
Bulletin 303.....	425
Bulletin 304.....	354
Part-Time Farming Survey, State of Washington: Statistical Summary.....	709

WEST VIRGINIA STATION:

Bulletin 261.....	649
Bulletin 262.....	637
Bulletin 263 (Biennial Report, 1933-34).....	589,
	606, 617, 635, 654, 671, 680, 695, 710, 728, 735

WISCONSIN STATION:

Bulletin 428 (Annual Report, 1933).....	436,
	448, 456, 466, 477, 488, 501, 515, 525, 528, 539, 547, 557, 559, 574
Research Bulletin 120.....	717
Research Bulletin 121.....	717
Research Bulletin 122.....	700

WYOMING STATION:

Bulletin 200.....	381
Bulletin 201.....	383
Bulletin 202.....	96
Bulletin 203.....	374
Forty-fourth Annual Report, 1934.....	589,
	606, 617, 635, 655, 671, 680, 689, 694, 710, 719, 733, 735

UNITED STATES DEPARTMENT OF AGRICULTURE
PUBLICATIONS ABSTRACTED

Technical Bulletin—

415. Shortening the Rest Period of the Potato, W. Stuart and E. H. Milstead.....	41
417. Beef Production and Quality as Influenced by Crossing Brahman with Hereford and Shorthorn Cattle, W. H. Black, A. T. Semple, and J. L. Lush.....	90
420. Poplars, Principal Tree Willows, and Walnuts of the Rocky Mountain Region, G. B. Sudworth.....	57
421. The External Anatomy of the Parlatoria Date Scale, <i>Parlatoria blanchardi</i> Targioni Tozzetti, with Studies of the Head Skeleton and Associated Parts, F. S. Stickney.....	507

Technical Bulletin—Continued.

Page

425. Marketing Cantaloups and Other Muskmelons, J. W. Park.....	121
426. The Relation of Fertilizers to the Control of Cotton Root Rot in Texas, H. V. Jordan, P. R. Dawson, J. J. Skinner, and J. H. Hunter.....	494
427. The Use of Naphthalene against the Japanese Beetle, W. E. Fleming and F. E. Baker.....	230
428. Cercospora Foot Rot of Winter Cereals, R. Sprague and H. Fellows.....	791
429. Pile Trestles as Channel Obstructions, D. L. Yarnell.....	541
430. The Physical and Chemical Characteristics of the Soils from the Erosion Experiment Stations.—Second Report, H. E. Middleton, C. S. Slater, and H. G. Byers.....	449
432. Studies of the Irrigation of Pear Orchards on Heavy Soil near Medford, Oreg., M. R. Lewis, R. A. Work, and W. W. Aldrich.....	480
434. Refrigerated Transportation of Bartlett Pears from the Pacific Northwest, E. D. Mallison and C. L. Powell.....	337
435. Comparison of Scabbed Barley, Normal Barley, and Yellow Corn in Diets for Laying Chickens, H. W. Titus and A. B. Godfrey.....	237
436. Cotton Root Rot as Affected by Crop Rotation and Tillage at San Antonio, Tex., G. T. Ratliffe.....	794
437. Development of the Swine Nematode <i>Strongyloides ransomi</i> and the Behavior of Its Infective Larvae, J. T. Lucker.....	695
438. The Effect of Homogenization on Certain Characteristics of Milk, C. J. Babcock.....	246
439. Policies Governing the Ownership of Return Waters from Irrigation, W. A. Hutchins.....	862
440. Shrinkage and Heat Penetration during the Roasting of Lamb and Mutton as Influenced by Carcass Grade, Ripening Period, and Cooking Method, L. M. Alexander and N. G. Clark.....	131
441. The Biology of <i>Cremastus flavoorbitalis</i> (Cameron), an Ichneumonid Parasite of the European Corn Borer, W. G. Bradley and E. D. Burgess.....	819
443. Application of Steam in the Sterilization of Soils, A. H. Senner.....	545
445. Market Distribution of Car-Lot Shipments of Fruits and Vegetables in the United States, J. W. Park.....	411
447. The Pepper Weevil, J. C. Elmore, A. C. Davis, and R. E. Campbell.....	511
449. Storage of Mill Cane, J. I. Lauritzen and R. T. Balch.....	471
450. Relation of Maturity and Handling of Bartlett Pears in the Pacific Northwest to Quality of the Canned Product, B. D. Ezell and H. C. Diehl.....	777
451. Cotton Production in Egypt, P. K. Norris.....	552
452. Experiments with Nitrogen Fertilizers on Cotton Soils, J. J. Skinner, R. A. Lineberry, J. E. Adams, C. B. Williams, and H. B. Mann.....	455
453. Responses of Strawberry Varieties and Species to Duration of the Daily Light Period, G. M. Darrow and G. F. Waldo.....	624
454. Agricultural Investigations at the Belle Fourche (S. Dak.) Field Station, 1926-32, B. Aune, L. A. Hurst, and A. Osenbrug.....	759,
	770, 826, 827, 831, 859, 894

Farmer's Bulletin—

Page

1726. Treatment and Care of Tree Wounds, J. F. Collins-----	628
1727. Selecting Hens for Egg Production, J. P. Quinn-----	91
1728. Flax-Fiber Production, B. B. Robinson-----	39
1729. Machinery for Dusting Cotton, R. C. Gaines and D. A. Isler----	117
1730. Rabbit Production, F. G. Ashbrook and C. E. Kellogg-----	375
1731. Alfalfa Varieties in the United States, H. L. Westover-----	319
1732. Growing Barley for Malt and Feed, H. V. Harlan-----	37
1733. Planning a Subsistence Homestead, W. W. Wilcox-----	127
1735. Pea Diseases and Their Control, L. L. Harter, W. J. Zaumeyer, and B. L. Wade-----	640
1736. Anthrax, W. S. Gochenour-----	837
1737. Stop Gullies—Save Your Farm, W. R. Mattoon-----	847
1738. Farmhouse Plans, W. Ashby-----	428
1741. Bur-Clover Cultivation and Utilization, R. McKee-----	762
1742. Game Laws for the Season 1934-35: A Summary of the Provi- sions of Federal, State, and Provincial Statutes, H. P. Sheldon and F. G. Grimes-----	356

Statistical Bulletin—

46. Car-Lot Shipments and Unloads of Important Fruits and Vege- tables for the Calendar Years 1931 and 1932-----	860
---	-----

Circular—

300. The Dairee Date, a Promising Mesopotamian Variety for Testing in the Southwest, R. W. Nixon-----	54
311. Bulbs from Seed, D. Griffiths-----	55
314. Community Production of Acala Cotton in New Mexico, A. R. Leding-----	119
316. Agronomic Evaluation Tests on Mechanical Blocking and Cross Cultivation of Sugar Beets, A. W. Skuderna, H. E. Brew- baker, C. E. Cormany, C. A. Lavis, S. B. Nuckols, C. Price, F. R. Immer, J. O. Culbertson, G. W. Deming, and E. M. Mervine-----	323
317. Protection of Orchard and Shade Trees and Ornamental Shrubs from Injury by the Japanese Beetle, W. E. Fleming, F. W. Metzger, and M. R. Osburn-----	81
318. A New Method of Self-Pollinating Cotton, W. W. Ballard----	39
319. Fertilizer Studies with Sugar Beets in the Arkansas Valley Area, Colo., 1921-28, L. A. Hurst and A. W. Skuderna-----	611
320. Report on a Preliminary Field Survey of the So-Called "Alkali Disease" of Livestock, K. W. Franke, T. D. Rice, A. G. Johnson, and H. W. Schoening-----	252
321. Use of Farm Machinery for Corn-Borer Control in the One- Generation Area, R. M. Merrill-----	705
322. Outbreaks of the Dutch Elm Disease in the United States, C. May-----	70
324. Studies on Handling Sugarcane Frozen Early in March in Ad- vanced Stages of Development, G. Arceneaux and R. B. Bisland-----	179
325. Field Experiments with Vernalized Wheat, H. H. McKinney, W. J. Sando, A. F. Swanson, V. C. Hubbard, G. S. Smith, C. A. Suneson, and J. L. Sutherland-----	325
326. Protecting Plants in the Home Yard from Injury by the Japanese Beetle, W. E. Fleming, F. W. Metzger, and M. R. Osburn-----	81

Circular—Continued.

Page

327. Influence of Spacing and Time of Planting on the Yield and Size of the Porto Rico Sweetpotato, J. H. Beattie, V. R. Boswell, and E. E. Hall.....	612
328. Methods of Reestablishing Buffalo Grass on Cultivated Land in the Great Plains, D. A. Savage.....	468
329. Manufacture, Composition, and Utilization of Dairy Byproducts for Feed, M. R. Coe.....	832

Leaflet—

104. Crested Wheatgrass, H. L. Westover.....	181
105. Quality Guide in Buying Ready-Made Dresses, C. L. Scott.....	285
106. Prevent Storage Rots of Sweetpotatoes, J. I. Lauritzen and L. L. Harter.....	352
107. The Barrel Seed Scarifier, W. M. Hurst, W. R. Humphries, and R. McKee.....	706
108. Controlling Kidney Worms in Swine in the Southern States, B. Schwartz.....	695

Miscellaneous Publication—

172. Bibliography on Land Settlement, with Particular Reference to Small Holdings and Subsistence Homesteads, compiled by L. O. Bercau, A. M. Hannay, and E. M. Colvin.....	403
184. Analysis of a Rigid Frame Concrete Arch Bridge, C. D. Geisler.....	702
188. Macrolepidoptera and Their Parasites Reared from Field Collections in the Northeastern Part of the United States, J. V. Schaffner, Jr., and C. L. Griswold.....	228
190. Handbook of United States Standards for Grading and Marketing Fresh Fruits and Vegetables.....	121
192. A Review of the Patents and Literature on the Manufacture of Potassium Nitrate with Notes on Its Occurrence and Uses, C. W. Whittaker and F. O. Lundstrom.....	165
195. A Plan for the Management of Brown Bear in Relation to Other Resources on Admiralty Island, Alaska, B. F. Heintzleman and H. W. Terhune.....	804
196. Floods and Accelerated Erosion in Northern Utah, R. W. Bailey, C. L. Forsling, and R. J. Becraft.....	541
197. The Hurricane, I. R. Tannehill.....	13
198. An Annotated Bibliography of the Hessian Fly <i>Phytophaga destructor</i> (Say), J. S. Wade.....	366
199. Barley Diseases Controlled by Seed Treatment, R. W. Leukel and V. F. Tapke.....	200
201. Traps for the Japanese Beetle and How to Use Them, F. W. Metzger.....	81
202. Federal Legislation, Rulings, and Regulations Affecting the State Agricultural Experiment Stations.....	141
203. Cotton and Cottonseed, compiled by R. P. Lane.....	763
206. The Naval Stores Station of the Bureau of Chemistry and Soils, F. P. Veitch.....	345
208. Motion Pictures of the United States Department of Agriculture, 1934.....	865
210. Status of Waterfowl in 1934, W. B. Bell and E. A. Preble.....	356
211. Officials and Organizations Concerned with Wildlife Protection, 1934, F. G. Grimes.....	650
212. A Low-Cutting Sled Corn Cutter, O. K. Hedden.....	851

Miscellaneous Publication—Continued.

	Page
213. High-Quality Cream for Butter Making Is Easily Produced by Following 3 Important Steps.....	526
215. The Agricultural Outlook for 1935.....	548
216. Meat Dishes at Low Cost.....	560
Inventory—	
112. Plant Material Introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, July 1 to September 30, 1932.....	166
113. Plant Material Introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, October 1 to December 31, 1932.....	598
114. Plant Material Introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, January 1 to March 31, 1933.....	598
Supplement No. 1 to Federal Legislation and Regulations relating to Highway Construction under the National Industrial Recovery Act, Federal Aid and National Forest Roads, Flood Relief, and Miscellaneous Matters.....	542
Report of the Secretary of Agriculture, 1934, H. A. Wallace.....	605, 616, 642, 650, 653, 671, 680, 700, 707, 735
Report of the Chief of the Bureau of Agricultural Economics, 1934, N. A. Olsen.....	707
Report of the Chief of the Bureau of Agricultural Engineering, 1934, S. H. McCrory.....	699
Report of the Chief of the Bureau of Animal Industry, 1934, J. R. Mohler.....	463, 514, 528, 556, 572
Report of the Chief of the Bureau of Biological Survey, 1934, J. N. Darling.....	500, 522
Report of the Chief of the Bureau of Chemistry and Soils, 1934, H. G. Knight.....	436, 448, 494, 502, 516, 564
Report of the Chief of the Bureau of Dairy Industry, 1934, O. E. Reed.....	463, 525
Report of the Chief of the Bureau of Entomology, 1934, L. A. Strong.....	634, 652
Report of the Chief of the Food and Drug Administration, 1934, W. G. Campbell.....	560
Report of the Forester, 1934, F. A. Silcox.....	628
Annual Report of the Chief of the Grain Futures Administration, 1934, J. W. T. Duvel.....	556
Report of the Chief of the Bureau of Home Economics, 1934, L. Stanley.....	560, 572, 574
Report of the Chief of the Bureau of Plant Industry, 1934, K. A. Ryerson.....	596, 605, 616, 633, 690
Report of the Acting Chief of the Bureau of Plant Quarantine, 1934, A. S. Hoyt.....	634, 653
Report of the Chief of the Bureau of Public Roads, 1934, T. H. MacDonald.....	542
Report of the Chief of the Weather Bureau, 1934, W. R. Gregg.....	447
Yearbook, 1934.....	7, 21, 30, 34, 55, 59, 61, 64, 65, 69, 70, 72, 74, 84, 87, 95, 101, 111, 113, 116, 118, 123, 126, 133, 134, 137, 139, 141

Crops and Markets—

Volume 11—	Page
No. 7, July 1934.....	126
No. 8, August 1934.....	271
No. 9, September 1934.....	271
No. 10, October 1934.....	556
No. 11, November 1934.....	556
No. 12, December 1934.....	859

BUREAU OF AGRICULTURAL ECONOMICS:

Agricultural Economics Bibliography—

No. 53. State Measures for the Relief of Agricultural Indebtedness in the United States, 1933 and 1934, compiled by M. T. Olcott and L. O. Bercaw.....	551
No. 54. Measures of Major Importance Enacted by the 73d Congress, compiled by V. E. Hitz.....	711

Foreign Agricultural Service—

F. S. 61. The Edible Fat Problem in Germany, H. E. Reed.....	121
F. S. 62. Cotton Production in the Anglo-Egyptian Sudan, P. K. Norris.....	408
Effects of the Drought of 1934 on Feed, Forage, and Livestock.....	860
Farm Value, Gross Income, and Cash Income from Farm Production, 1931-1932-1933.....	860
Fats and Oils: Statistics of United States Production, Trade, and Consumption, 1912-1933.....	121
Handbook of Instructions for the Installation and Operation of the Tag-Heppenstall Moisture Meter, D. A. Coleman and H. C. Fellows.....	326
Index Numbers of Prices Paid by Farmers for Commodities Bought, 1910-1934.....	860
Index Numbers of Prices Received by Farmers for Farm Products, 1910-1934, as Revised 1934.....	860
The Analysis of Variance Method of Measuring Differences between Staple-Length Designations of Press-Box and Cut Samples of Cotton, F. H. Harper and W. B. Lanham.....	321
The National Food Supply, 1934-35.....	861

BUREAU OF AGRICULTURAL ENGINEERING:

Brief Instructions for the Design and Construction of Small Dams for Emergency Conservation Work in North Dakota, L. C. Tschudy and J. G. Sutton.....	111
Latest Results of Engineering Experiments at the Soil Erosion Experiment Stations, C. E. Ramser.....	700
Report on C. W. A. National Survey of Rural Electrification, G. W. Kable and R. B. Gray.....	702
Terracing in a Land Use Program, S. P. Lyle.....	701

BUREAU OF ANIMAL INDUSTRY:

Animal Husbandry Division, A. H. Mimeogr.—

No. 1. Brewery, Distillery, Vinegar, and Yeast By-Products for Feeding Livestock, E. W. Sheets, A. T. Semple, and J. B. Shepherd.....	88
No. 2. Segregating Baby Chicks at Hatching Time.....	94

BUREAU OF CHEMISTRY AND SOILS:

[Soil Survey Report], Series 1930—

No. 20. Soil Survey of Vermillion County, Indiana, W. H. Buckhannan et al.-----	Page 14
---	------------

[Soil Survey Report], Series 1931—

No. 4. Soil Survey of Rockbridge County, Virginia, R. C. Journey et al.-----	590
No. 5. Soil Survey of Sherman County, Nebraska, L. A. Brown et al.-----	744
No. 6. Soil Survey of Bay County, Michigan, C. H. Wonser et al.-----	744
Patent Lists 13-36, [Lists of United States Patents Relating to Insect Traps], compiled by R. C. Roark.-----	502
Review of U. S. Patents Relating to Pest Control, Volume 7, Nos. 1-8, January-August 1934.-----	808
Devil's Shoestring (<i>Cracca virginiana</i> L.) a Potential Source of Rotenone and Related Insecticides, R. C. Roark.-----	504

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE:

Review of U. S. Patents Relating to Pest Control, Volume 7, Nos. 9-12, September-December 1934.-----	808
--	-----

FOREST SERVICE:

Bibliography of Organic and Forest Soils, 1926-1934.-----	745
Floor Panels with Stressed Plywood Coverings, G. W. Trayer.-----	543
List of Publications on the Growth, Structure, and Identification of Wood.-----	629
Lumber Distribution and Consumption, 1932, R. V. Reynolds and A. H. Pierson.-----	57
Painting Exterior Woodwork, F. L. Browne.-----	543
Plywood as a Structural Covering for Frame Walls and Wall Units, G. W. Trayer.-----	395
The Bending of Wood, T. R. C. Wilson.-----	543

BUREAU OF HOME ECONOMICS:

Closets and Other Storage Arrangements for the Farm Home, M. M. Wilson.-----	734
Home Dyeing with Natural Dyes, M. S. Furry and B. M. Viemont.-----	139
Meat Cooking Charts 1-7, [Meat Cooking Charts].-----	414

BUREAU OF PLANT INDUSTRY:

Plant Disease Reporter, volume 18—	
No. 10, August 15, 1934.-----	59
No. 11, September 15, 1934.-----	195
No. 12, October 1, 1934.-----	195
No. 13, October 15, 1934.-----	346
No. 14, November 15, 1934.-----	488
No. 15, December 1, 1934.-----	488

BUREAU OF PUBLIC ROADS:

Public Roads, volume 15—	
No. 5, July 1934.-----	111
No. 6, August 1934.-----	111
No. 7, September 1934.-----	262
No. 8, October 1934.-----	395
No. 9, November 1934.-----	395
No. 10, December 1934.-----	702

WEATHER BUREAU:

Monthly Weather Review, volume 62—	Page
No. 5, May 1934.....	159
No. 6, June 1934.....	159
No. 7, July 1934.....	741
No. 8, August 1934.....	740, 741
Climatological Data, volume 21—	
Nos. 3-4, March-April 1934.....	13
Nos. 5-6, May-June 1934.....	160
Nos. 7-8, July-August 1934.....	742

AGRICULTURAL ADJUSTMENT ADMINISTRATION:

Achieving a Balanced Agriculture.....	548
---------------------------------------	-----

JOURNAL OF AGRICULTURAL RESEARCH

Volume 48—

No. 9, May 1, 1934.....	520
No. 12, June 15, 1934.....	6, 38, 59, 61, 62, 63, 65, 132

Volume 49—

No. 1, July 1, 1934.....	8, 38, 57, 67, 76, 80, 81, 83, 109
No. 2, July 15, 1934.....	25, 42, 43, 63, 71, 88, 132
No. 3, August 1, 1934.....	5, 31, 33, 63, 64, 72
No. 4, August 15, 1934.....	150, 203, 209, 211, 223
No. 5, September 1, 1934.....	196, 204, 206, 244
No. 6, September 15, 1934.....	485, 493, 496, 498, 507
No. 7, October 1, 1934.....	462, 463, 472, 485, 492, 494
No. 8, October 15, 1934.....	600, 609, 629, 646, 650, 672
No. 9, November 1, 1934.....	759, 794, 796

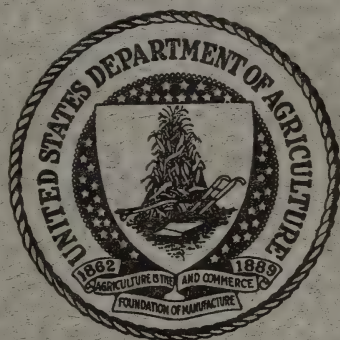
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 72

JANUARY 1935

No. 1

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soil and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment—
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDkamp.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 72, NO. 1

	Page
Editorial:	
The forty-eighth convention of the Association of Land-Grant Colleges and Universities.....	1
Recent work in agricultural science.....	5
Agricultural and biological chemistry.....	5
Agricultural meteorology.....	12
Soils—fertilizers.....	13
Agricultural botany.....	25
Genetics.....	31
Field crops.....	34
Horticulture.....	46
Forestry.....	55
Diseases of plants.....	57
Economic zoology—entomology.....	72
Animal production.....	85
Dairy farming—dairying.....	95
Veterinary medicine.....	101
Agricultural engineering.....	110
Agricultural economics.....	118
Rural sociology.....	127
Agricultural and home economics education.....	129
Foods—human nutrition.....	130
Textiles and clothing.....	139
Home management and equipment.....	139
Miscellaneous.....	141
Notes.....	143

EXPERIMENT STATION RECORD

VOL. 72

JANUARY 1935

No. 1

EDITORIAL

THE FORTY-EIGHTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

Adhering to its long-established custom of meeting in Washington, D. C., in alternate years, the Association of Land-Grant Colleges and Universities returned to this city for its forty-eighth annual convention, held from November 19 to 21, 1934. The appropriateness of this setting under the prevailing conditions was apparent, for the program was built around the theme of national relationships, and most of the distinguished guests who addressed the convention are prominent in national affairs. Opportunity was thus afforded to an unusual degree for contacts and conferences of great value, and the convention was correspondingly productive of enlightenment, stimulation, and an intensified spirit of coordination and cooperation.

The improved economic security of most of the constituent institutions was reflected in what was probably the largest attendance for several years, taxing available accommodations at many points. The registration from outside of Washington exceeded 300 and included representatives from every State and the Territory of Hawaii. Enlarged State delegations, in some cases including from 10 to 15 persons, were general, thereby providing not only for presidents, deans, and directors but subordinates and specialists along subject-matter lines. The result was a gathering of diversified interests and one broadly typical of the institutions as a whole.

Many of those in attendance were active participants in other meetings which preceded, overlapped, or followed the convention. Among these were the American Country Life Association, the American Soil Survey Association, the American Society of Agronomy, the National Association of State Universities, and other less formally organized bodies. While the meeting places of these groups were more widely scattered than usual, making the interchanging of attendance somewhat difficult, the various programs provided a wealth of information on current problems in agriculture and related fields and opportunity for first-hand contacts with the leadership organized for their solution.

Conspicuous among the representatives of the Federal Government participating in the convention program were those from the Federal Department of Agriculture, including the Secretary, the Assistant Secretary, the Administrator of the Agricultural Adjustment Administration and several of his assistants, and the chiefs and staff members of most of the other bureaus and offices. Addresses were also given by Mr. Harry L. Hopkins, Administrator of the Federal Emergency Relief Administration; Mr. F. A. Delano, chairman of the National Resources Board; Mr. George N. Peek, special adviser to the President on foreign trade and president of the Export-Import Bank; the new Commissioner of Education, J. W. Studebaker; and Mr. Walton Hale Hamilton, a member of the National Industrial Recovery Board.

Most of these speakers dwelt upon the problems of recovery from the prevailing economic situation. Mr. Hopkins discussed rural rehabilitation, Mr. Delano land utilization, and Mr. Hamilton the meaning of N. R. A. Foreign trade and agriculture was considered by Mr. Peek and also by Dr. Mordecai Ezekiel, economic adviser to the Secretary of Agriculture, the latter more specifically as to the interest of agriculture in reciprocal trade agreements. The price situation was discussed from a national viewpoint by Dr. George F. Warren of Cornell University. Mr. F. A. Silcox, Chief of the U. S. D. A. Forest Service, explained the proposed shelter belt project for reforestation. The A. A. A. program was considered in its general aspects by Secretary Wallace and in more detail by various other speakers.

The relationship of the land-grant institutions to these new undertakings is obviously a matter of outstanding importance both to the institutions themselves and to the Nation. Under the title *Relation of Land-Grant Colleges to the Present Situation*, it received extended consideration in the address of the president of the association, President T. O. Walton of Texas. President Walton saw in the events of the past few years the beginnings of a new social order, with such problems as soil erosion, the effect of tariffs, and the use of increased leisure and other economic and social readjustments pressing for solution. The land-grant colleges, in his opinion, should render full cooperation to other workers along these lines and should be prepared for larger service as fact-finding and contact agencies. This functioning, he pointed out, calls for a strengthening and expansion rather than a curtailment of existing research and extension facilities.

Secretary Wallace, speaking especially from the long-time point of view, visualized the need of a coordinating agency for readjustments and expressed the hope that the land-grant colleges would render a large service in this direction. He indicated his belief

that their existence as permanent institutions had insured a continuity of effort which, coupled with their approach to new problems from a decentralized and democratic viewpoint, had been of great value to the Nation, and he urged upon them as fundamental the formulation of policies and objectives covering at least the next decade.

The need of planning was also taken up from various angles by other speakers. Mr. Delano, for example, summarized informally some of the findings with respect to land use of the National Resources Board, which in July 1934 replaced the National Planning Board, and Dr. L. C. Gray, in charge of the Division of Land Economics of the U. S. D. A. Bureau of Agricultural Economics, discussed this report and the organization of the Board in greater detail. The experiment station section devoted its initial session to a symposium on research in relation to planned agriculture, Assistant Secretary of Agriculture M. L. Wilson and Director H. R. Tolley of the A. A. A. Program Planning Committee considering the topic with reference to land use, and Dr. O. E. Baker of the U. S. D. A. Bureau of Agricultural Economics and Dean C. L. Christensen of Wisconsin in its relation to consumption needs. Director Tolley also addressed the general sessions on planning for agriculture, and Director W. L. Slate of Connecticut took up in the section of agriculture the relationship of the experiment stations to State and regional planning.

The A. A. A. programs were also discussed in their relation to the land-grant colleges by Extension Director H. J. C. Umberger of Kansas and in their relation to extension by Administrator C. C. Davis and a number of members of his staff, while in the section of home economics Dr. Frederic C. Howe, consumers' counsel of the A. A. A., discussed *The Consumer: The New Agency in Government and Its Purposes and Possibilities*. Information on the rural rehabilitation program and the opportunities open to the land-grant institutions in the field of rural welfare was contributed by Dr. Dwight Sanderson, coordinator of rural research for the Federal Emergency Relief Administration, and on rural rehabilitation and the extension service by Col. Lawrence Westbrook, assistant administrator of the F. E. R. A. Dr. C. B. Smith of the Extension Service took up the need of new objectives in extension from the point of view of farm life readjustments, Director C. W. Warburton the future of home demonstration work in the extension program, and Dean R. L. Watts of Pennsylvania the need of new emphasis on such old elements as land utilization, efficient production and marketing, cooperation, diversification, and rural sociological studies.

The stress placed throughout the convention upon close inter-relationships between existing agencies found application in the pro-

nounced trend toward increased coordination and cooperation. One of the most important sessions was that held jointly by the experiment station subsection and the section of home economics, in which the formulation of a coordinated program of research was discussed by a group of bureau chiefs of the Federal Department and directors of the State experiment stations. A final recommendation from the special committee on Federal-State relations in agricultural research, which has been very helpful for several years in the promotion of such relationships, that a joint conference of Department and station officials constitute a permanent feature of each experiment station section meeting held in Washington was adopted.

Elsewhere in the program were addresses of Deans W. C. Coffey of Minnesota and C. E. Ladd of Cornell University on the coordination of resident teaching, experiment station research, and extension work in the field of home economics; by Dean H. H. Kildee of Iowa on correlating the work of agricultural colleges and Smith-Hughes schools; and by Dean Ladd on the use of Federal appropriations by the States, in which he suggested the provision of additional funds partly for long-time regional studies under allocation by the Federal Department of Agriculture and in part as emergency appropriations definitely allotted to the States. Greetings to the convention by President Edward A. O'Neal of the American Farm Bureau Federation and by telegram from the National Grange in session at Hartford, Conn., gave evidence of the many matters of common interest between the association and these important organizations.

Many items of business were under consideration by the executive body, but its sessions were as usual held behind closed doors and little information as to action taken is available for presentation at this time. The presidency of the association was bestowed upon President F. L. McVey of Kentucky and the vice presidency upon Dean and Director J. G. Lipman of New Jersey. Dean and Director F. B. Mumford of Missouri was reelected to the executive committee for a 5-year term, and Dean and Director T. P. Cooper of Kentucky was continued as secretary-treasurer. Numerous changes in the committees were made, notably the breaking up of the committee on instruction in agriculture, home economics, and mechanic arts into three committees dealing with agriculture, home economics, and engineering, the addition to the standing committees of experiment station and extension organization and policy of a subcommittee on home economics, and the establishment of a special committee on land problems. The complete list of committee changes, as well as of the section officers, may be found on page 143.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Note on the nitrogen content of certain proteins, M. L. SMITH, A. M. BROWN, and C. GROSS (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1473-1476).—The authors note that although the figures for nitrogen content of various proteins usually stated vary from 15 to 16 percent, or even higher, "the nitrogen content of certain proteins derived from diphtheria toxin, and from diphtheria and other sera, when determined by the micro-Kjeldahl method is considerably lower, varying from 13.57 to 14.64 percent. The average is 14.18, giving a nitrogen factor of about 7.05."

The cystine, tryptophane, and tyrosine content of the soybean, F. A. CSONKA and D. B. JONES (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 3, pp. 279-282).—The amino acids cystine, tryptophan, and tyrosine in the soybean were determined quantitatively in whole samples (tryptophan, tyrosine) and in 10 percent aqueous sodium chloride extracts of samples (cystine) of soybean meal from which the greater part of the fat had been removed by ether extraction and much of the hull by sifting. Despite observations to the contrary recorded by Lugg (see above), it is believed that such carbohydrate as was present in the extracts used for the cystine determinations did not interfere with the estimation, as the results appeared to confirm those of determinations made directly on the soybean protein (E. S. R., 69, p. 4). Tryptophan was estimated by a method essentially that of May and Rose (E. S. R., 48, p. 312) and cystine by the Sullivan method (E. S. R., 70, p. 444).

"It was found that the percentage of these amino acids varies in different varieties. It is suggested that varieties should be selected for planting which produce more and better quality protein from the nutritional standpoint."

The isolation of glutamine from an enzymic digest of gliadin, M. DAMODARAN, G. JAABACK, and A. C. CHIBNALL (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1704-1713).—"Glutamine has been isolated from an enzymic digest of gliadin, thereby providing additional evidence of the validity of the amide hypothesis which was first demonstrated by the isolation of asparagine from edestin."

The instability of glutamine in aqueous solution and its bearing on previous work on the nature and extent of enzymic hydrolysis of proteins are briefly discussed.

The pectic constituents of citrus fruits, L. W. GADDUM (*Florida Sta. Bul.* 268 (1934), pp. 23, fig. 1).—The data presented would appear to indicate that in the orange, grapefruit, and kumquat the percentage of total pectic compounds in the albedo and in the pulp remains constant through a considerable part of the growth period; that the percentage of water-soluble pectins in these tissues rises to a maximum value just prior to the decline in total pectic content, and then gradually declines; that the rate of conversion of protopectin into water-soluble pectins is greater in the pulp than in the albedo; that the degree of methylation is less in the water-extracted pectins than in the corresponding

acid-extracted pectins; that the degree of methylation of the water-extracted pectins declines as maturation of the fruit progresses, while that of the acid-extracted pectins remains fairly constant; and that the purity and degree of methylation of the pectins extracted from the pulp are less than that of pectins from the albedo, though greater than that of pectins from the juice.

For the water-extracted pectins, the figures are considered to have shown a very close correlation between viscosity and degree of methylation and between jelly strength and degree of methylation, although for the acid-extracted pectins, only fair correlations were found.

The percentage of calcium present in the calcium pectates derived from the various reprecipitated pectins approached a value between 7.4 and 7.6.

Studies on plant amylases.—I, The effect of starch concentration upon the velocity of hydrolysis by the amylase of germinated barley, C. S. HANES (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1406-1421, figs. 4).—The author points out that "for the determination of enzymic reaction velocity under readily definable conditions, the states near the initiation of the reaction are decidedly the best." He further observes that in most cases "this part of the progress has been left unexplored, and delineation of it has been based merely upon empirical expressions of doubtful value. In the present paper data have been directly collected within a few minutes of the origination of the reaction on the mixing of enzyme and substrate. From these data 'initial slopes' are determined graphically and used as a measure of reaction velocity." Such an initial slope method for the measurement of the velocity of the hydrolysis of starch in the presence of amylase is detailed. An investigation of the effect of starch concentration upon the velocity of the hydrolysis induced by the amylase of germinated barley led to the conclusion that "the observed relationship is in close agreement with that predicted by the Michaelis theory."

The effect of heat on sugar solutions used for culture media, M. L. SMITH (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1467-1472).—Sterilizing in an autoclave at 15 lb. steam pressure caused hydrolysis of maltose to glucose and slow destruction of the glucose with the production of acid. The changes in sugar concentration on autoclaving were accelerated by the addition of phosphates. In capacity to cause the destruction of maltose and glucose, 1 hr. at 100° C. was found approximately equivalent to 20 min. under 15 lb. excess pressure.

An investigation of the thermal death point of *Saccharomyces ellipsoideus*, H. AREF and W. V. CRUESS (*Jour. Bact.*, 27 (1934), No. 5, pp. 443-452, figs. 6).—The death temperature of a strain of *S. ellipsoideus* (wine yeast) from California grapes varied to a considerable extent with the length of the heating period. Thus at pH 3.8 in grape juice it was killed at 57.5° in 10 min. and at 54° C. in 120 min. The death temperature was affected but little over a range of pH 1.45 to 7.0, although resistance appeared to be greatest at pH 3.8 to 4.0. Applying N₂ and CO₂ under pressure of from 5 to 25 lb. per square inch during heating lowered the death temperature measurably, but not markedly. About 55° was considered feasible as a temperature for fruit juice pasteurization.—(*Courtesy Biol. Abs.*)

The microbial decomposition of successive cuttings of alfalfa hay under aerobic conditions, E. A. BEAVENS and L. H. JAMES (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1121-1126, figs. 4).—The authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., report upon an investigation undertaken to determine what, if any, differences in the decomposition of successive cuttings of alfalfa hay appear in their aerobic fermentation by soil micro-organisms as a result of differences in chemical composition at the stages of growth represented by the three cuttings studied.

"Data on the microbial decomposition of each cutting were obtained by measuring the daily evolution of carbon dioxide during a test period of 30 days, and by chemical analyses before and after fermentation. Of the three cuttings of hay tested from the 1931 and 1932 crops, the third cutting underwent the greatest decomposition, the first cutting was next in order, and the second cutting showed the least decomposition. The greatest variation in the rate of decomposition occurred during the first 10 to 12 days of the fermentations, after which it gradually decreased to the end of the experiment."

Rancidity in foods delayed by excluding certain wave lengths of light, M. R. COE (*U. S. Dept. Agr. Yearbook 1934*, pp. 306-308).—The shade of green found most effective in delaying the onset of rancidity was found to be one transmitting only between $\lambda=490\text{ m}\mu$ and $\lambda=580\text{ m}\mu$. The wavelengths principally absorbed by oils and fats are said to be those in the ultraviolet and blue and, to a lesser extent, those in the red. Both groups of radiations are largely excluded by green wrappers having a fairly restricted transmission band, and protection is attributed to this action of the wrapper.

An ultra-violet irradiation unit, G. P. GOODE (*Bul. Basic Sci. Res.*, 5 (1933), No. 1-4, pp. 39-45, figs. 4).—"An irradiation unit, equipped with liquid filters, is described, by means of which various materials may be irradiated with selected wave bands in the ultraviolet region."

A simple method for determining ultraviolet absorption spectra of solutions, J. R. LOOFBOUROW (*Bul. Basic Sci. Res.*, 5 (1933), No. 1-4, pp. 46-55, fig. 3).—Some of the defects of the "match-point" technic for determining ultraviolet absorption spectra of solutions as ordinarily applied with a small quartz spectrograph are discussed, and a method which is said to overcome these difficulties partially or wholly is described in detail with the precautions essential to accurate results.

The near infra-red absorption spectrum of calciferol, E. SHELOW (*Bul. Basic Sci. Res.*, 5 (1933), No. 1-4, pp. 1-4, fig. 1).—Infrared absorption spectra of ergosterol and of calciferol prepared from ergosterol by the method of Askew et al. (*E. S. R.*, 67, p. 201) were found to be sufficiently alike in general form and location of persisting bands (1.55μ and 2.05μ) to indicate that calciferol is an isomer of ergosterol.

A provitamin A other than carotene? E. BOYLE (*Nature [London]*, 133 (1934), No. 3369, p. 798).—A concentrate from turbot liver oil estimated by spectrographic and colorimetric tests to contain 60 percent vitamin A in terms of the Carr-Jewell concentrate (*E. S. R.*, 69, p. 325) was irradiated in concentrations of 0.0011 and 0.00011 percent in spectroscopic alcohol in the complete absence of air, with light of wave length 300-390 $\text{m}\mu$. The stronger solution was only slightly affected by exposure for 3 hr., but the more dilute solution proved very sensitive. Consequently solutions of the latter concentrate were irradiated in lots of 60 cc for different periods of time, with constant stirring with a magnetic stirrer during the irradiation. The solutions were then evaporated in vacuo at 50°C . and brought to a concentration equivalent spectroscopically at 328 $\text{m}\mu$ to a solution containing 0.0011 percent vitamin A, after which the absorption curves in the ultraviolet and the blue values were determined.

Irradiation up to 3 min. caused a decrease in both values, but further irradiation caused a progressive increase, reaching a maximum after 21 min. with a percentage vitamin A value of 140, as determined spectroscopically, and 130 by the blue value. Further irradiation caused rapid destruction of the vitamin. "The nonirradiated concentrate in the blue value test showed a band at 565 $\text{m}\mu$. After 3 minutes' irradiation the band had changed to 575

m μ , after 21 minutes 575 m μ . Thus the chromogen responsible for the 565 m μ band is the precursor of the 575 m μ chromogen, which is either a purer vitamin A than that of Carr and Jewell or a sterol with very much higher spectroscopic and colorimetric values."

The grouping of halibut-liver oils, R. T. M. HAINES and J. C. DRUMMOND (*Jour. Soc. Chem. Indus., Trans.*, 53 (1934), No. 11, pp. 81T, 82T, fig. 1).—Further analyses (E. S. R., 69, p. 465) of genuine halibut-liver oils for blue units and iodine numbers are reported. The samples included 12 oils from west Greenland, 5 Labrador oils, and 6 from east Greenland and Faeröerne (Faeroe Is.). When the data were plotted in the form of graphs, the points representing the west Greenland oils fell on a smooth curve which was practically a straight line below 2,000 blue units (5 percent vitamin A). The data for the other oils showed the same tendency, although the blue values were too nearly alike to give striking results.

These findings point to a definite correlation between the blue values and iodine numbers of genuine oils and the probability that oils from different localities vary in their iodine:blue value ratio.

An extension of the study to the examination of a number of commercial samples from Danish, Norwegian, and American sources gave entirely different values, leading to the suspicion that the oils were a blend of halibut-liver oil with cod-liver oil or other fish-liver oils of similar character. On adding varying percentages of cod-liver oil to halibut-liver oil and determining the blue and iodine values, results were obtained leading to the conclusion that a mixture of about 30 percent of cod-liver oil with 70 percent of a halibut-liver oil with a blue value of about 1,750 would give the same value as one of the American oils examined. "It should be possible, therefore, to distinguish a pure halibut-liver oil from any oils blended with cod-liver or similar oils by a consideration of the iodine value/blue value ratio, particularly if the origin of the halibut-liver oil is known."

The occurrence of ferrous iron in phosphate rock, H. L. MARSHALL (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 71-76).—In the investigation upon which report is made in this contribution from the Bureau of Chemistry and Soils, U. S. D. A., 24 samples of phosphate rock from various deposits in the United States were analyzed for ferrous iron. Comparative determinations on several samples showed hydrochloric acid (1:4) to be as efficient as a mixture of sulfuric and hydrofluoric acids in dissolving the ferrous iron in phosphate rock. Digestion of the sample with phosphoric acid (1:3) usually gave results slightly lower than those obtained by digestion with hydrochloric acid. In the presence of high percentages of acid-insoluble sulfide the figures for ferrous iron obtained by the hydrochloric acid digestion method were usually much higher than were those obtained when the rock was digested with phosphoric acid.

Figures for total and ferrous iron soluble in the hydrochloric and in the phosphoric acid reagent, as well as for hydrogen sulfide liberated by 1:4 hydrochloric acid, for sulfide insoluble in this reagent, for vanadium, and for organic carbon, as found in phosphate samples from a number of deposits, are recorded. "In general, the data indicate that the ferrous iron content of domestic rock seldom, if ever, exceeds 50 percent of the total iron. In many samples, particularly Tennessee brown-rock phosphate and the Florida soft and waste-pond phosphates, less than 10 percent of the total iron is present in the ferrous condition."

[Analytical work of the Kentucky Station] (*Kentucky Sta. Rpt. 1933, pt. 1, pp. 44-46*).—Analytical work on the iodine content of corn produced in 19

eastern Kentucky counties and on the iodine content of Kentucky limestones and milk and a method for the determination of carbon and nitrogen in the same sample are noted.

The use of the Sakaguchi reaction for the quantitative determination of arginine. E. JORPES and S. THORÉN (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1504-1506).—The reaction of arginine with α -naphthol and sodium hypobromite to give a reddish color, though shown also by other monosubstituted guanidines, was found not to be given by other amino acids, and to be sensitive enough to permit its use for the determination of very small quantities of arginine. Since the color is easily and rapidly destroyed by an excess of the hypobromite reagent, however, and is, further, largely inhibited by the temperature unless the reagents are cooled, the reaction required to be applied with care if quantitative results were to be obtained.

The method as here described requires the following reagents: (1) An arginine solution containing 0.04-0.07 mg arginine in 5 cc; (2) a 10-percent solution of sodium hydroxide solution; (3) a 0.02-percent solution of α -naphthol, made fresh each time by the dilution of 20 cc of a stock solution (0.1 percent in alcohol) to 100 cc with water; (4) a hypobromite solution made by dissolving 2.5 g (0.46 cc) bromine in 100 cc 5-percent cooled sodium hydroxide solution, this solution keeping for months in the cold; and (5) a 40-percent urea solution.

In the carrying out of the determination, "a test tube, 150×18 mm, with 5 cc arginine solution is cooled on ice. One cc of solution 2 (sodium hydroxide solution) is added and 1 cc of solution 3 (α -naphthol), the solutions mixed and the test tube well embedded in ice. After a time (1 hr.) 0.2 cc of solution 4 (hypobromite) is added with vigorous shaking, and exactly 15 sec. later 1 cc of solution 4 (cooled urea solution). The photometric reading is made against water in [filter] S. 50 within 6-8 min. For amounts of arginine between 0.04 and 0.08 mg, which is the range found most convenient in our experiments, a 0.5-cm dish is used. The amount of arginine present is found directly from the curve on semilogarithmic paper.

"If all precautions are strictly taken, this method is as good as any ordinary colorimetric procedure. The duplicates agree to within $\frac{1}{2}$ percent. As neutralized phosphotungstic acid up to 1 percent of the final arginine solution does not influence the color intensity, this colorimetric method may replace the alkaline hydrolysis of the Van Slyke procedure."

Some sources of error in the estimation of cysteine and cystine in complex materials when acid hydrolysis is employed. J. W. H. LUGG (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1022-1029).—The author of this contribution from the University of Adelaide heated cystine and cysteine in hydrochloric acid solution, both alone and in the presence of urea, various amino acids, and such carbohydrates as cellulose, sucrose, and arabinose. He also investigated the effects of reduction with stannous chloride; and of oxidation with hydrogen peroxide, with ferricyanide, with chromates, with persulfates, with iodates, and with iodine, with any of which "over the range pH 3 to 6 cysteine may be oxidized more or less completely to cystine . . ." It is noted, however, that "no safe method of oxidizing the cysteine rapidly to cystine before it can react with carbohydrate decomposition products has been found."

Form the point of view of the hydrolysis of a protein for the determination of cystine and cysteine, the findings were, in part, that "cystine is reasonably stable when heated for 20 hr. in 5 N HCl at 100° [C.], either alone or with such substances as urea and stable amino acids. Under similar conditions cysteine is decomposed to the extent of about 1 percent, one of the decomposition

products being H_2S . When heated at the boiling point, the loss of cystine is about 6 percent, but if estimated as disulfide, only 2 percent. When heated with stannous chloride in acid solution, cystine is reduced to the extent of about 98 percent to cysteine, and a little H_2S is produced.

"When cystine and cysteine in acid solution are heated with carbohydrates, variable amounts are lost. In actual experiments, when the humins formed were about 20 times the weight of the cystine or cysteine originally present, 6 to 7 percent of the cystine and at least 85 percent of the cysteine were lost. The cystine loss increased to about 80 percent when the weight of humin was about 360 times that of the cystine originally present. When heated with carbohydrates in the presence of stannous chloride, cystine is lost just as extensively as is cysteine in the absence of stannous chloride. Whereas the loss of cystine appears to be due to ordinary adsorption on the particles of humin, the far more extensive loss of cysteine is presumably due to condensation. Carbohydrate humins are aldehydic in character, and in this connection it is known that the simple aliphatic mercaptans readily condense with aldehydes and ketones, forming mercaptals and mercaptols, respectively.

"It would appear from these experimental findings that pure proteins on hydrolysis would yield practically all their cysteine and cystine, provided that these amino acids were not decomposed during the rupture of the protein and peptide linkages, that no humins were formed, and that there were nothing present in the protein that would react with either cysteine or cystine. Part of the cysteine would be converted into cystine unless air were excluded. With relatively small amounts of carbohydrate present, such as might occur in the protein molecule, the loss of cystine originally present would be very small, but the loss of cysteine might be very serious. Humins of strictly amino origin, such as those formed from tryptophan and tyrosine, presumably carry cystine down just as do carbohydrate humins, but unless they specifically adsorb cystine the loss in this direction would be very slight. With relatively large amounts of carbohydrate present, the cystine loss can be very serious and the cysteine loss virtually complete. . . .

"The practice of adding stannous chloride before hydrolysis to minimize humin formation not only fails to prevent a loss of cysteine but causes the loss of any cystine present by reducing it to cysteine. If sufficient ferric salts or their precursors were present in a material they could destroy some of the cystine and most of the cysteine during hydrolysis. The salts of certain other heavy metals would also interfere badly."

The colorimetric determination of histidine, E. JORPES (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1507-1511).—The method described requires (1) a neutral or faintly acid histidine solution containing 0.05–0.005 mg histidine per cubic centimeter; (2) a diazonium solution prepared by adding to 1.5 cc of a solution containing 0.9 g sulfanilic acid and 9 cc concentrated HCl in 100 cc, 1.5 cc of a 5 percent sodium nitrite solution; and (3) 1.1 percent sodium carbonate solution (Kahlbaum's anhydrous sodium carbonate). The mixture in (2) is cooled on ice for 5 min., then 6 cc of the nitrite solution is added with shaking, and after cooling for 6 min. water is added to 50 cc. "The diazonium solution should be kept on ice. It keeps for 24 hr. The solution of sulfanilic acid keeps for years. The best results are obtained if the 5 percent solution of sodium nitrite is freshly prepared." The procedure is as follows:

"To 1 cc of solution 1 (histidine) 2 cc of solution 2 (diazonium) are added. After 1–3 hr. 5 cc of solution 3 (carbonate) are added. The reading is made with filter S. 50 of the step-photometer 4–8 min. after the addition of solution 3.

"The amount of histidine present in the specimen is calculated from the figure found for ϵ or $-\log_{10} \frac{I_p}{I_a}$. If 1-cc solution or 8-cc reaction mixture contains 0.1 mg histidine, the figure for $-\log_{10} \frac{I_p}{I_a}$ is 2.66, d being 1 cm. If the tests are performed as described above, the color intensity is directly proportional to the histidine content when this is from 0.05 to 0.005 mg per cubic centimeter. Almost the same figure for ϵ was obtained on three different occasions with a 3 to 6 months' interval, viz, 2.66, 2.69, and 2.66. These figures were obtained with a specimen of *l*-histidine dihydrochloride, which contained 18.57, 18.41 percent N (Kjeldahl), calculated 18.43 percent."

The determination of blood-proteins by acid-acetone, J. RACE (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1571-1584, figs. 7).—In attempting to weigh the total blood protein precipitate produced by treating the blood samples with trichloroacetic acid, after washing the precipitate with alcohol and with ether, the author observed the result to be always low; about two-thirds of the total protein indicated by other methods having remained insoluble after the alcohol treatment in the example given. The loss was traced to re-solution of a considerable part of the precipitate by the alcohol. Acetone of a concentration of from 75 to 85 percent and acidified with 2.5 cc per 100 cc of 20 percent trichloroacetic acid proved capable, under the conditions detailed, of redissolving the albumin quantitatively, leaving the serum globulin as the insoluble residue.

It is further recorded that "in experiments with pure proteins and varying concentrations of acetone (or alcohol), a node was found in the curves at 25-30 percent of acetone (or alcohol) corresponding to the concentration at which the surface tension shows the maximum deviation from the mixture law. All the blood albumins tested (human, sheep, ox, and horse) were entirely soluble in acid acetone, but egg albumin was insoluble. The solubility of the various proteins is determined by the rate of denaturation and coagulation in acid acetone."

The determination of glucose and maltose in aqueous solution and in broth and peptone solutions, M. L. SMITH (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1459-1466, figs. 2).—The author has extended the method of Shaffer and Hartmann (*E. S. R.*, 45, p. 111) for the determination of small amounts of glucose to permit the determination of maltose and of mixtures of maltose and glucose, adapting the method especially to the determination of maltose and glucose in peptone and digest culture media. It is shown that in such media, 0.1-0.4 percent glucose or maltose can be recovered with an error not exceeding 5 percent of the amount estimated.

Indirect methods for the estimation of sugar in pineapple juices, F. A. E. ABEL, O. C. MAGISTAD, C. A. FARDEN, and L. LOUIS ([*Hawaii.*] *Pineapple Producers' Sta. Bul.* 14 (1934), pp. 27).—An attempt was made "to derive by correlation analysis relationships between percent sugars, Brix, acidity, and refractive index of pineapple fruit juices. It was hoped that these relationships, when determined, would form the basis of . . . a short but reliable method for estimating the amount of sugars in the juices", the usual chemical methods being considered too slow.

The Brix readings were always higher than those corresponding to the actual quantity of total sugars because of the presence of nonsugar solids including acids, salts, and proteins. Although the nonsugar solids were insufficient to account quantitatively for the difference, the equation

percent sugars as dextrose = degrees Brix - 3 times percent total acid

"gave satisfactory evidence of its usefulness" in locations without laboratory

facilities, "and the great saving in time and expense has made a larger number of studies possible."

The determination of small quantities of iodine in blood, E. N. ALLOTT, J. A. DAUPHINEE, and W. H. HURTLEY (*Biochem. Jour.*, 26 (1932), No. 5, pp. 1665-1671, figs. 2).—Ashing in the presence of sufficient alkali caused no loss at temperatures up to 500° C. during 2 hours' heating. The 10-cc samples used were treated with 1.5 cc of 10 N potassium hydroxide in a nickel dish, dried at 150°, and ashed by heating for 1 hr. at 500°. The residue was extracted with small quantities of distilled water, the dried residue extracted with alcohol, and the extract dried. The iodine was set free by treatment with a very small quantity of nitrosulfonic acid, and was extracted with specially purified carbon disulfide and estimated colorimetrically.

The conditions under which the titration method might be of reasonable accuracy were also studied in some detail.

AGRICULTURAL METEOROLOGY

Agricultural meteorology: Studies in micro-climatology, I, L. A. RAMDAS, R. J. KALAMKAR, and K. M. GADGE (*Indian Jour. Agr. Sci.*, 4 (1934), No. 3, pp. 451-467, figs. 4).—Stating that in agricultural meteorology it is precisely those air layers that are usually avoided by the meteorologist which assume great importance, the authors report and interpret observations on the relation between meteorological conditions at a standard observatory where the exposure is unaffected by vegetation and those recorded at a similar station situated in a small open space surrounded by crops. The crops in which the observations were made were sorghum and sugarcane. In the open the range of dry-bulb temperature was 26.1° C. at 0.8 cm and decreased rapidly to 19° at 183 cm. In sorghum and sugarcane the range was lowest near the soil and increased with height. The least variation during 24 hr. occurred in sugarcane. In the open and in sorghum the diurnal range in wet-bulb temperature decreased with height. In sugarcane the maximum was reached at about 15 cm. In the open the range of humidity was uniform at all levels. In sorghum and sugarcane the range increased with height.

Rate of evaporation from the soil [trans. title], E. PANTANELLI (*Met. Prat.*, 14 (1933), No. 5-6, pp. [7]).—It is shown in this article that the rate of evaporation is determined to a large extent by the character of the soil, particularly the colloid content.

Forests and rainfall [trans. title], LAFOSSE and BOLLÉY (*Compt. Rend. Acad. Agr. France*, 20 (1934), No. 2, pp. 75-85; *abs. in Ann. Agron. [Paris]*, n. ser., 4 (1934), No. 2, p. 301).—The author concludes that forests establish and maintain an intercirculatory action between the soil and the air which results in an important contribution to saturation of the air and in a general condition favorable to precipitation.

Can climate be humanly controlled? D. MILLER (*Tex. Weekly*, 10 (1934), No. 31, pp. 8, 9).—Reviewing current comment pro and con, the author takes the position that the proposed \$75,000,000 shelter belt, north and south across the center of the country, "will probably modify climate and stabilize agriculture."

[Climate of the new cotton regions in the U. S. S. R.], N. P. ZHURAVSKAYA, A. D. GEDEONOV, and E. E. FEDOROV (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, 26 (1931), No. 5, pp. 179-266, pls. 2, figs. 3; *Eng. abs.*, pp. 265, 266).—On the basis of a study of 12 cotton growing areas in the Crimea, North Caucasus, and the lower part of the Volga

River regions, the climatic characteristics and adaptation of each area with reference to cotton growing are discussed in considerable detail.

Cold winter in Alaska, R. L. FROST (*Bul. Amer. Met. Soc.*, 15 (1934), No. 5, pp. 137-141).—It is stated that from December 15, 1933, to January 4, 1934, the highest temperature recorded at Fairbanks, Alaska, was 3° F. and the mean for the 3 weeks was -34.4°. During the period January 10 to 27, the mean temperature was -47.6°, and on 3 consecutive days the mean was -60°. On one day the minimum temperature was -66°.

The measurement of solar ultraviolet radiation during the period of "polar year" 1932 to 1933 [trans. title], Y. OOKUMA, H. OOMORI, and Y. KUROSE (*Bul. Sci. Fakult. Terkult., Kjušu Imp. Univ., Fukuoka, Japan.*, 6 (1934), No. 1, pp. 34-87, pl. 1, figs. 6; *Eng. abs.*, p. 87).—Observations, by the Hill method and the photoelectric cell method, on the intensity of solar ultraviolet radiation made on the roof of a building as well as in the field during 13 months beginning with August 1932 are recorded and discussed. It was found that the intensity of solar ultraviolet radiation usually reached its maximum at 12:30 p. m. and during the month of August. The minimum was recorded during January. The maximum thus occurred during the month of highest temperature in Japan.

The hurricane, I. R. TANNEHILL (*U. S. Dept. Agr., Misc. Pub.* 197 (1934), pp. 14, figs. 15).—This publication discusses the history and attendant phenomena of hurricanes in America, their frequency, premonitory symptoms, and tracks.

Climatological data for the United States by sections, [March-April 1934] (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 21 (1934), Nos. 3, pp. [207], pls. 3, figs. 2; 4, pp. [203], pls. 3, figs. 2).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

SOILS—FERTILIZERS

[Soil investigations of the Idaho Station] (*Idaho Sta. Bul.* 205 (1934), pp. 7-10, 34, fig. 1).—Data are briefly reported on the high water requirements of "slick" soils, the service of drainage and organic matter in reclamation of alkali soils (based on alkali studies conducted in cooperation with the U. S. Department of Agriculture), the response of Idaho soils to fertilizers, the slight value of raw rock phosphate under Idaho conditions, the increase in nitrogen content produced in alfalfa and soils in northern Idaho by gypsum and sulfur and by manure in Palouse soils, and the inhibition of bacterial life by coniferous timber residues in the soil.

[Soils and crops work at the Indiana Station: Moses Fell Annex Farm], A. T. WIANCKO and G. P. WALKER (*Indiana Sta. Circ.* 203 (1934), pp. 4-8, fig. 1).—The plat and field work of the general fertility test, and the special experiments on nitrogen top-dressing and comparative value of sources of phosphorus (*E. S. R.*, 69, p. 776; 71, p. 160) are here reported upon for the 1933 season.

[Soil and fertilizer studies of the Kentucky Station] (*Kentucky Sta. Rpt.* 1933, pt. 1, pp. 33-35, 66, 67).—Rotation studies and fineness of ground limestone and rate of liming experiments are briefly noted.

[Notes on soils and soil fertility trials] (*Maryland Sta. Bul.* 362 (1934), pp. 379-395).—The bulletin contains notes on distribution and character of Maryland soils, by O. C. Bruce; on the use of manure and fertilizers in a crop rotation, by J. E. Metzger; on fertilizer placement tests, by R. P. Thomas; on liming Eastern Shore soils, by H. B. Winant; on liming Chester soils, by

F. F. Nichels and Thomas; on phosphorus needs of some Maryland soils, by R. A. Fisher and Thomas; on potash fertilization on some Maryland soils, by J. P. Bewley, J. E. Schueler, and Thomas; on management of soils subject to tobacco brown root rot, by E. D. Matthews, C. A. Reneger, and Thomas; and on manganese fertilization on Coastal Plain soils, by E. H. Schmidt, Schueler, and Thomas.

[**Soil investigations of the New Jersey Stations**] (*New Jersey Stas. Bien. Rpt. 1932-33*, pp. 81, 82-87).—Brief notes are given on organic matter for soil improvement, by H. B. Sprague; on fertilizer and lime studies, lysimeter and base-exchange studies, colloid soil chemistry, and soil survey and land utilization, by A. W. Blair; and a short general summary of the soil microbiology work, by S. A. Waksman.

Soils and crops of the Imperial Valley, S. W. COSBY and L. G. GOAR (*California Sta. Circ. 334 (1934)*, pp. 1-44, figs. 9).—The part of this bulletin here dealt with, namely, that concerned with the soils of the Imperial Valley, contains a brief descriptive introduction and takes up the further topics climate, the soil material, soils of the Imperial Valley, three decades of agricultural development, crop distribution in relation to soil type, and irrigation and soil management. The remaining sections are noted on pages 34 and 46.

Soil survey of Vermillion County, Indiana, W. H. BUCKHANNAN and J. S. JAMES (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No. 20*, pp. 39, pl. 1, fig. 1, map 1).—Part 1 (pp. 1-25) deals with the description and classification of the county, and part 2, by A. T. Wiancko and S. D. Conner (pp. 25-38), with the chemical composition and management of its soils.

Vermillion County has an area of 163,840 acres and possesses in general the surface features of a smooth plain, and its drainage is affected mainly by three large streams flowing eastward across the county toward the Wabash River. The soils form 22 types, here assigned to 16 series. Russell silt loam, with the inclusion of a slope phase, occupies 24.9 percent of the area, Fincastle silt loam covers 15.6 percent, and, with the inclusion of its prairie phase, Brookston silty clay loam totals 14.7 percent.

The principal soils of New Jersey and their utilization for agriculture, L. L. LEE (*New Jersey Stas. Bul. 569 (1934)*, pp. 16, fig. 1).—On the basis of the data obtained in the now completed soil survey of the State the author presents a summary review of the soil resources of the State, the area as a whole being divided into zones while the soils are treated as series, classes, and types, with reference to (1) geological origin, (2) mode of formation, (3) color, (4) topographic position, (5) drainage, (6) profile, and (7) chemical composition. The zones recognized are: Zone I—the Kittatinny Mountain and Valley belt, Zone II—the highland and gneiss belt, Zone III—the red sandstone and shale belt, Zone IV—the heavy coastal plain belt, and Zone V—the light or sandy coastal plain belt. Other topics dealt with include the agricultural soils of the State—present and potential, nonagricultural soils (submarginal land), and the use of land for crop production.

In considering the last-named subject the author urges that, in view of the fact that the best yields are only to be had on the soils most suitable for the crop in question, "New Jersey growers should therefore learn to recognize their soils by name and attempt the cultivation of only such crops as are known to be adapted to their particular soil.

"The problem of crop planning and adaptation to soil becomes of particular importance in New Jersey, where detailed soil studies and surveys have indicated that in most counties greatly diversified soil conditions exist, in which many farms and even individual fields are made up of several different soils.

The same problem assumes even greater importance when these same studies indicate that there are 193 different soils in the State."

Soil, field-crop, and pasture management for Suffolk and Nassau Counties, New York, I, III ([*New York*] *Cornell Sta. Bul.* 600 (1934), pp. 1-45, 63-67, figs. 23).—The two sections of this bulletin here noted deal with the pedological phases of the investigation. Part 2 is noted on p. 37.

I. Soil and field-crop management, A. F. Gustafson.—This part discusses very briefly the Wisconsin glaciation and other influences which have affected the formation of the Suffolk and Nassau County soils, and the following, among other related topics: Climate; topography and drainage; soil areas, including the Bridgehampton silt loam, Hempstead loam, Sassafras silt loam, Sassafras loam, Sassafras sandy loam, Plymouth-Haven, and Greenport clay loam areas, together with sand and peat areas; crop adaptations of Suffolk and Nassau County soils; composition of the soils; lime relations and soil acidity; animal and green manures; fertilizers and their use; and feed-crop rotations and fertilization.

III. Soil map and soil-type descriptions, F. B. Howe and A. F. Gustafson.—This part contains in condensed form the more important soil data from the report of the 1928 soil survey of Suffolk and Nassau Counties (E. S. R., 69, p. 333).

Soils in relation to fruit growing in New York.—V, The vineyard soils of the Westfield area, Chautauqua County, J. OSKAMP ([*New York*] *Cornell Sta. Bul.* 609 (1934), pp. 18, figs. 7).—The author finds, in this case as in that of the apple orchard soils upon which report was made in Bulletin 592 (E. S. R., 71, p. 748), that a well-oxidized soil is most favorable. It should consist of "a fairly light-textured soil material varying but slightly in the surface 4 ft., with a bright and uniform shade of brown in the soil and the subsoil, indicating a poorly oxidized condition, it is considerably less favorable too largely of coarse particles or if there is a very shallow deposit of loam over almost clean sand and gravel, may be lacking in the elements of fertility. Where the profile shows a subsoil heavier than the surface soil, with a clay horizon at a depth of about 2 or 3 ft. and a highly mottled color of the subsoil, indicating a poorly oxidized condition, it is considerably less favorable for grapes. A distinctly unfavorable condition for grapes exists where the profile is marked by a gray or grayish yellow layer close beneath the surface soil, underlaid by a highly mottled subsoil of heavy clay."

Available potash and phosphorus contents of Vermont pasture soils, G. L. LEA and A. R. MIDGLEY (*Vermont Sta. Bul.* 373 (1934), pp. 21, pls. 4, figs. 3).—The principal Vermont pasture soils were studied with reference to their content of available potassium and phosphorus and their lime requirements. The bulletin contains also a brief description of each of the soil groups considered, together with photographs of typical areas of several of them.

The Neubauer (E. S. R., 53, p. 319) was compared with three different chemical methods and was used in conjunction with one of these to secure data for a potassium availability map of Vermont soils. With the exception of those of the Champlain Valley group, the pasture soils examined were found to need potassium and, in most cases, phosphorus. The soils of the Mohawk group showed little need for lime, the remainder a rather high lime requirement.

Methods and scope of soil surveys in western Canada, A. H. JOEL (*Empire Jour. Expt. Agr.*, 1 (1933), No. 1, pp. 33-42, pls. 2).—The author considers the special interest of the soil surveys conducted since about 1920 in western Canada to lie in the facts that "in the first place, they have been conducted over a large area and in a region having zones apparently very similar to those

of Russia. In the second place, the western Canadian conception of soil surveys offers something original in that it embodies what the Canadian workers considered to be the best features of the American soil surveys and of the Russian school of genetical soil classification. Another reason is that the soil workers of the prairie provinces of Canada have worked quite independently and with a free hand in a new field, and have consequently followed methods and produced results differing somewhat from those of soil surveys in other parts of the world." He outlines the aims of the surveys in question, the methods employed, the modes of soil classification which have been used and the more important soil groups which have been set up, and the present and proposed applications of the information recorded.

Investigation of soil profiles from Cyprus.—I, Profiles of soils over limestone and serpentine, A. REIFENBERG and E. K. EWBANK (*Empire Jour. Expt. Agr.*, 1 (1933), No. 1, pp. 85-96, fig. 1).—The authors take up in this report upon the first stage of their investigation the geology and climate of Cyprus, the weathering of sedimentary rocks and the formation of terra rossa, and the weathering of igneous rocks as represented by serpentine.

They found, in part, that "although there are rich accumulations of humus in the mountains of Cyprus, there are no signs of podsol formation. The bleaching process that occurs in cold, humid countries, the transport of sesquioxides in humus solutions, and their accumulation at a lower level cannot occur in Mediterranean countries, where the humus is nearly always neutral. The increase of sesquioxides in the soil is, in the main, not only relative, i. e., due to the loss of other constituents, but also absolute, for their loss from the weathering zone can often be observed. Although much silica is carried away from siliceous igneous rocks, our analyses show that this loss is too small appreciably to diminish the silica in the soil; from this standpoint, therefore, the Mediterranean climate is not a mean between a temperate and a tropical climate, as some authors have assumed."

The red and black basaltic soils of Indochina, Y. HENRY (*Terres rouges et terres noires basaltiques d'Indochine. Hanoï, French Indochina: Govt., 1931, pp. 211, pls. 69, figs. 3*).—Following a brief introduction, indicative of the general nature of the study undertaken, chapter 1 takes up surveys and maps, the results of the analysis (including those of mechanical analyses and physical tests, the results of chemicocolloidal examinations, and those of the purely chemical analyses). Chapter 2, on the basaltic formations, deals first with the general distribution of the formations, proceeding to separate discussions of the configuration and structure, the climate, and the nature and composition of the soils of the formations respectively designated as those of Song Bé and Bas Dongnaï, Haut Dongnaï, Kontum-Darlac, Bolovens, Phuquy, Quangtri, and Phuyên. Chapter 3, on the placing of the basaltic soils in cultivation, considers first the origin and formation of the soils, discussing the basalts, their decomposition, and the present state of the soils of Indochina; second, the character and cultural technic of these soils, including the physical characteristics of the soils, their chemicocolloidal and chemical composition, and the moisture and humus problem. An appendix covers the methods of analysis.

Alkaline soils [trans. title], N. F. VASQUEZ (*Min. Fomento, Dir. Agr. y Ganaderia [Peru], Circ. 20 (1933), pp. 31-38*).—The author here discusses the origin of "alkali" soils, the salts present in white and in black alkali soils, the effects of such salts upon plants, their effect upon the soil, the means of recognizing saline and alkaline soils, the determination of the quantity of salts present, the improvement of saline and of alkaline salts, and the relative tolerance of crop plants for alkali conditions.

The physico-chemical properties of soils affecting soil erosion, J. F. Lutz (*Missouri Sta. Res. Bul. 212 (1934), pp. 45, figs. 11*).—"The nonerosive nature of the Davidson clay is largely due to the high degree of aggregation of the B horizon into large, porous, and stable granules. The erosive character of the Iredell is due to its ease of dispersion and the dense, impervious nature of the B horizon. A small content of aggregates >0.25 mm in diameter is present in this layer. All Davidson colloids were flocculated irrespective of the nature of the exchangeable cation on the complex. Only the H-, Ba-, and Ca-saturated Iredell colloids were flocculated. The electrokinetic potentials of the colloids from the Iredell, Davidson, and Putnam soils were of practically the same value, indicating that hydration rather than charge was the main contributing factor to stability in those systems. The order of swelling for different colloids was bentonite $>$ Putnam $>$ Iredell $>$ Davidson. This is the reverse order of the $\text{SiO}_2 : \text{R}_2\text{O}_3$ ratios. Exchangeable Ca, Ba, and H cations decreased the swelling of the colloids in the order named. The K, Na, and Li cations showed no definite order of effect on the swelling of colloids. The order of permeability of the different clay membranes was $\text{H} > \text{Ba} > \text{Ca} > \text{K} > \text{Na} > \text{Li}$. The permeability of the H, Ba, and Ca membranes was in the same order as the relative viscosity of these systems. The order of permeability was the reverse of that for swelling. The high state of aggregation of the Davidson soil is due to the flocculated and nonhydrated condition of the colloidal fraction. Hydration of the Iredell colloid is responsible for the low state of aggregation and impermeability of the natural soil. Physical properties of soils affecting permeability and the ease of dispersion are paramount factors influencing the erosiveness of various soils."

Experimental studies on the development of heavy claypanns in soils, G. D. SMITH (*Missouri Sta. Res. Bul. 210 (1934), pp. 31, figs. 13*).—A method of passing clay through beds of sand in such a manner as to permit a quantitative measurement of pan formation is described, in part, as follows:

Coarse, medium, fine, and very fine sands and coarse silt (materials covering a total pore-size range of from 129 to 3.1μ) having been separated and purified, "the soil skeleton was prepared in the following way: A series of burettes with an average cross section of 12 mm was selected, and, to retain the sand, the base of each was filled with large glass beads, 0.42 cm in diameter. Five cc of sand were placed in the burette on top of the beads, and water was forced through the system from below rapidly enough to suspend the sand. The water was then shut off and the particles allowed to settle. This gave a final separation according to size and placed the smallest grains in the group together at the top of the sand column. The burette was struck sharply a number of times to settle and pack the sand and was then considered ready for use. Air was never allowed to enter the pores of the column after the sand was placed in the burette.

"Before the clay sol was passed through the sand, the rate of flow of water through the bed was determined. It was found that this rate depended somewhat upon the way the glass beads fitted the base of the burette, and in order to get a uniform rate of flow through different burettes, it was necessary to vary somewhat the head of water. A standard rate of flow of 5 cc in 23 to 24 sec. was selected arbitrarily, and the head necessary to give this flow was determined empirically for each burette. Sufficient water was then passed through to be sure that the rate of flow did not change with percolation, that is, to insure stable particle arrangement. Burettes which showed a variation in the rate of percolation greater than 0.6 sec. were discarded." The preparation of the clay sols and the measurement of the rate of pan formation

are similarly detailed. Experiments carried out in the manner indicated led to the following, among other, conclusions:

Flocculation of a sol by electrolytes or oppositely charged colloids causes a pan to form. The rate of pan formation by a flocculated clay rapidly increases with the valence of the flocculating ion. A pan may be formed in the absence of flocculated aggregates by building up alternate layers of positive iron and negative clay sols on the walls of the pores. The presence of protective humus decreases pan formation insofar as it decreases flocculation. Putnam clay, if sufficiently dispersed, will not form a pan in quartz sand. The ground waters from typical clay pan areas in Missouri and Illinois contain sufficient electrolytes to flocculate a clay sol.

Soil moisture in relation to the plant [trans. title], N. F. VASQUEZ (*Min. Fomento, Dir. Agr. y Ganaderia [Peru], Circ. 20 (1933), pp. 21-30*).—This paper is a semipopular discussion of such matters as the quantity of water required by plants, the distribution of water in the soil, classification of the forms in which water exists in the soil, coefficients and factors (coefficient of hygroscopicity, wilting coefficient, moisture equivalent, and moisture-holding capacity), available water, fundamental basis for the determination of the wilting coefficient, determination of the moisture equivalent, determination of the water-holding capacity, wilting of plants because of a lack of soil moisture, and resistance of plants to drying.

The determination of carbon dioxide evolution in soil, M. H. BROWN (*Jour. Amer. Soc. Agron., 26 (1934), No. 6, pp. 481-485*).—The author reports, in a contribution from the Iowa Experiment Station, upon experiments on soil carbon dioxide evolution under conditions of continuous and of intermittent aeration, and of accumulation of the gas to a concentration of about 12 percent in the overlying area.

It is recorded that "no differences were observed in amounts of carbon dioxide produced when the air of the flask was changed each 24 hr., and when the carbon dioxide was allowed to accumulate from day to day until the concentration in the air above the soil reached slightly over 12 percent. The data secured with the aeration method indicate that had the moisture content of these soils been maintained, the amounts of carbon dioxide produced probably would have been the same as those produced by the other soils.

"These results indicate that the production of carbon dioxide may not be affected by concentrations of this gas up to 12 percent in the air above the soil, and that constant aeration at 5 l per hour did not stimulate production. This indicates three possibilities. First, that carbon dioxide may not inhibit the action of certain micro-organisms which produce it when present in the air in concentrations up to 12 percent. As the amount of air in a loam soil at optimum moisture conditions occupies about one-fourth of the total volume, it is possible that in a normal soil the micro-organisms live and function under much higher concentrations of this gas. Second, that the inherent properties of the soil and its moisture content affect the rate of production and consequently the diffusion of this gas to a much greater extent than its concentration in the air above the soil. Third, assuming that the gas diffused quite rapidly into the air above the soil, the rate of action of the micro-organisms may not be affected by rapid diffusion of this gas.

"The accumulation-aeration method is by far the most desirable method of the three to use in carbon dioxide studies. . . . The data reported in the aeration study required 80 titrations, each of which presented a chance for error. In addition, the suction pump required attention several times each day to insure a uniform rate of aeration. These tests show that no differences

occurred in the amounts of carbon dioxide produced when the soil was aerated constantly or intermittently, or when the carbon dioxide was allowed to accumulate up to a concentration of 12 percent in the air above the soil."

The organic matter of the soil [trans. title], N. F. VASQUEZ (*Min. Fomento, Dir. Agr. y Ganaderia* [Peru], *Circ. 20* (1933), pp. 16-20).—The author sums up the functions of organic matter in the soil as the production of energy, the formation of carbon dioxide, the liberation of simple substances, the formation of humus, and the effect of organic matter on the physical properties of the soil. His brief popular discussion of the subject is based upon the outline indicated.

Do soil organisms compete for nutrients useful to crops? R. E. STEPHENSON (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 6, pp. 513-518).—Soil organisms utilize available mineral nutrients, in the experiments recorded in this contribution from the Oregon Experiment Station, but usually not to an extent to offer serious competition with crops. Competition for mineral nutrients was found much less easily demonstrable than competition for available nitrogen. Organic substances (e. g., dextrose) containing neither nitrogen nor minerals resulted in sufficient stimulation of biological activity to reduce somewhat the quantity of water-soluble mineral nutrients found in the soil. The decomposition of organic substances containing mineral nutrients and also fairly high in nitrogen, such as legume residues and stable manure, resulted in an increased supply of available minerals, particularly potassium, water solubility being used as a measure of availability.

"The beneficial effect of soil organisms in liberating plant food in the soil seems to overshadow possible harmful effects of competition."

The metabolism of some nitrogen-fixing Clostridia, W. H. WILLIS (*Iowa Sta. Res. Bul. 173* (1934), pp. 253-284).—The experiments here recorded were concerned with nitrogen-fixing Clostridia of the species *Clostridium pastorianum* and *C. butyricum* and with a soil anaerobe not yet identified, all found in considerable abundance in the widely distributed Iowa soil types Tama silt loam and Grundy silt loam. The subjects of the investigation included the reaction requirements, capacity to fix gaseous nitrogen, and production of carbon dioxide under varying controlled conditions in the laboratory of these species. Lime at various rates of application had little effect upon the numbers of anaerobic nitrogen fixers or upon their ability to fix nitrogen in soil-solution cultures in the presence of nitrogen gas, and the initial pH of the medium apparently had very little effect upon the quantity of nitrogen fixed over a range of pH values from 5.0 to 9.5. In all the cultures the final pH after 3 weeks was near 5.0. The amount of the acid produced at various intervals over a 133-hour period in mixed cultures of soil anaerobes appeared to be closely related to the quantities of glucose utilized. No relationship between the initial reaction of the medium and the nitrogen fixed over a 20-day period was observed, however. "Apparently the optimum pH for growth and nitrogen fixation by the soil anaerobes extends over a wide range, and the organisms are somewhat tolerant of acidity." Throughout the experiments, however, the presence of calcium carbonate in the medium had a marked beneficial effect upon the nitrogen-fixing Clostridia. This effect was indicated not only in the growth of the organisms in the various cultures and in the utilization of glucose, but also in the fixation of nitrogen.

"The nitrogen metabolism of mixed cultures of soil anaerobes was studied in Winogradsky's nitrogen-free medium containing 0.2 g of calcium chloride per liter or 15 g of calcium carbonate per liter. Comparatively large amounts of nitrogen were fixed in both media, with a tendency for the amount to be

larger in the calcium carbonate medium. In the calcium chloride medium larger amounts of ammonia and amino nitrogen were produced than in the carbonate medium. Larger amounts of acid were present in the cultures containing the calcium chloride. The metabolism of the two pure cultures of soil anaerobes, No. 4, not identified, and No. 5, *C. butyricum*, was also studied in these two media. In the calcium chloride medium culture 5 was somewhat more efficient in fixing nitrogen. Glucose utilization was greatly stimulated by the presence of calcium carbonate, the effect being somewhat more pronounced with culture 5. The carbonate also had a beneficial effect upon the amounts of nitrogen fixed in both cultures. There was some relation between the rate of nitrogen fixation and the glucose utilization and also between the rate of acid production and the glucose utilization. Nitrites and nitrates were produced in both cultures in the calcium carbonate medium, but none were found in the presence of calcium chloride.

"Results obtained with *C. butyricum* growing in media containing varying nitrogen sources and in a nitrogen-free medium, all with calcium carbonate, showed that the presence of combined nitrogen in the medium greatly stimulated the utilization of glucose during the first part of the incubation period. The entire amount of glucose present in all the cultures was utilized, however, by the end of 25 days. The most rapid utilization occurred when sodium nitrate was used as a nitrogen source. Practically negligible amounts of nitrogen were fixed in the media containing combined nitrogen, while comparatively large amounts were fixed in the nitrogen-free medium. Apparently the calcium carbonate did not immediately neutralize the acids as they were formed, but the reaction proceeded slowly over the entire incubation period.

"In experiments on carbon dioxide production with a pure culture of *C. butyricum* in various media containing calcium carbonate, it was found that large amounts of carbon dioxide were produced under anaerobic conditions. The largest amounts were produced in the peptone medium. Production was about the same in sodium nitrate and nitrogen-free media. Only very small amounts of carbon dioxide were produced in the similar media containing calcium chloride instead of calcium carbonate. The presence of air apparently stimulated the production of carbon dioxide by *C. butyricum* in the peptone medium, but exerted a detrimental effect when the sodium nitrate and nitrogen-free media were used. The retarding effect of calcium chloride was less pronounced in the peptone medium when air was present. The source of the carbon dioxide produced in the peptone medium containing calcium carbonate was presumably in the glucose molecule. A small portion of the carbon dioxide was produced as a result of the interaction of the calcium carbonate with the acids formed."

The cause of decreased nodule formation on legumes supplied with abundant combined nitrogen, F. E. ALLISON and C. A. LUDWIG (*Soil Sci.*, 37 (1934), No. 6, pp. 431-443).—Experiments showing that sucrose, added to sand cultures of alfalfa, tended to overcome the injurious effect of nitrate on nodule formation except at the highest concentration of nitrate used are reported in a contribution from the Bureau of Chemistry and Soils, U. S. D. A. This beneficial effect of sucrose was observed even though, when used alone, the sugar retarded germination and early plant growth.

"It is believed that the evidence from all the experimental work so far reported proves beyond a reasonable degree of doubt that decreased nodulation in the presence of soluble nitrogenous salts is due to inadequate carbohydrate supply in the roots. The effect on the bacteria themselves plays a very secondary role in the phenomenon. Where nitrogen is abundant, the carbohydrate

synthesized is used for top growth and little is available for the growth of roots or nodules. Nodules grow only where enough carbohydrate is present to allow at least a moderate root growth."

[Articles on fertilizers] (*U. S. Dept. Agr. Yearbook 1934*, pp. 209-215, fig. 1).—The following brief articles on the manufacture and use of fertilizers are included: Fertilizers May Add to Soil Acidity—Neutral Mixtures Desirable, by F. E. Allison (pp. 209-211); Fertilizer Studies Show Important Possibilities in Ammoniated Peat, by R. O. E. Davis (pp. 211-214); and Fertilizers without Filler Cost Less and Meet Ordinary Needs, by A. L. Mehring (pp. 214, 215).

Plant feeding by briquette fertilization, F. E. HANCE (*Soil Sci.*, 37 (1934), No. 6, pp. 445-457, pls. 3).—The briquetting of fertilizers appears to the author of this communication from the Hawaiian Sugar Planters' Association Experiment Station to offer a means of supplying a plant with insoluble or soluble nutrients under such conditions as would render ordinary fertilizer mixtures prohibitively costly or impractical. The scheme is suggested as an expedient for overcoming heavy potash leaching or excessive soil phosphate fixation. Mechanical and chemical means of briquetting fertilizers are described.

"The development may be adjusted to meet the requirements of almost any type of soil, crop, or plant." The advantages over regular practice believed to be gained in special cases by employing briquetted fertilizer are discussed. Basic formulas intended to be varied to suit individual needs are given. Responses of plant growth to the briquette fertilization in a stream bed of running water are described. Results obtained by briquette fertilization of trees in a dry-land practice and of sugarcane in concrete tubs are discussed and illustrated with photographs.

A study of the effect of certain ammonium compounds on the soil and on the crop, A. L. PRINCE and A. W. BLAIR (*New Jersey Stat. Bul.* 571 (1934), pp. 20, figs. 7).—This bulletin reports upon a study of the effects of ammonium sulfate and other ammonium compounds, applied at various rates and periods, on the dry weight and nitrogen content of cabbage plants, grown on limed and unlimed Sassafras sand.

"On the limed sand, cabbage plants outgrew the initial injury due to an excessive application of ammonium sulfate. This injury was not nearly so marked where the nitrogen was applied in successive quarter doses or where the total amount was applied 10 days before seeding." The toxic effect of ammonium sulfate used in high amounts on a neutral soil appeared due to excessive salt concentration rather than to ammonia, since similar results were obtained with equivalent amounts of nitrate of soda. Calcium sulfate, calcium carbonate, and superphosphate used alone and in various combinations with different amounts of diammonium phosphate showed the corrective effect on the toxic effects of large amounts of diammonium phosphate, "probably because the original soil was strongly acid. . . . There were some indications, however, that calcium sulfate does partially offset some of the toxic effects obtained from the use of large amounts of diammonium phosphate."

The acidity of light-textured soils was increased by the continued use of ammonium sulfate roughly in proportion to the quantity applied. "However, the presence of a plentiful supply of nitrogen tends to a certain extent to offset the injurious effect of increasing acidity up to a certain pH value critical to the crop grown." Nitrification was observed to proceed very slowly in sands under acid conditions. In a Sassafras sand of pH 4.6, nearly 75 percent of the ammonia applied as ammonium sulfate still remained in the soil as ammonium salts after 13 weeks.

Mineral nitrogen determinations on the mature cabbage plants indicated that as the application of ammonium sulfate increased the mineral nitrogen in

the crop also increased. The proportion of the total nitrogen found to be in the mineral state varied with the treatment from 3 to 13 percent. The total nitrogen in the mature cabbage plants varied from 1.6 to over 4 percent with the highest application of ammonium sulfate. The proportion of the applied nitrogen recovered in the crop varied from 55 to 85 percent, "but there was a remarkable similarity in the average amount recovered for the three different methods of application. It is realized that this high recovery could be obtained only in pot experiments under controlled conditions." A "luxury" consumption of nitrogen appeared to take place with high applications of ammonium sulfate, since cabbage plants receiving a smaller application of nitrogen made nearly as much dry matter. "Cabbage seedlings 1 week old were very high in both total and mineral nitrogen. A rapid decrease in both total and mineral nitrogen occurred with the age of the plant for the first 4 weeks. After that period the decrease was very gradual. Seedlings grown with nitrate of soda showed the greatest amount of mineral nitrogen for the first week. After the first week, seedlings grown with ammonium sulfate showed the most mineral nitrogen over a 6-week period. During this period the mineral nitrogen content of the seedlings varied from over 1 percent during the first week to only a few hundredths of a percent at the end of 6 weeks."

The influence of the pH of a culture solution on the assimilation of ammonium and nitrate nitrogen by the tomato plant, H. E. CLARK and J. W. SHIVE (*Soil Sci.*, 37 (1934), No. 6, pp. 459-476, figs. 4).—It was shown by the authors of this contribution from the New Jersey Experiment Stations that in the case of tomato plants grown in solutions containing equal concentrations of ammonium-N and of nitrate-N and adjusted to the pH values 4.0, 5.0, 6.0, and 7.0, the concentration of nitrate-N in the roots of plants of a given age was approximately the same in all of the plants, although the rates of absorption of nitrate-N from solutions of different pH were markedly different. The concentration of ammonium-N in the roots, on the other hand, varied with the pH of the external medium, higher concentrations of ammonium-N being present in the roots of plants grown in solutions of high pH than in those grown in solutions of low pH, and high concentrations of ammonium-N in the roots accompanied high rates of absorption of ammonium-N from the solutions. High concentrations of ammonium-N in the roots were also accompanied by high concentrations of basic-free amino nitrogen, "an indication of a rapid formation of amino nitrogen in the roots from the $\text{NH}_4\text{-N}$ present."

Other observations and conclusions included the following: "In the roots the percentage of total soluble organic nitrogen composed of basic nitrogen was relatively low whenever the percentage of amino nitrogen in the corresponding extract was high, and vice versa. This relationship was correlated with the pH of the culture solutions in that high concentrations of amino nitrogen were present in the roots of the plants grown in solutions of high pH, from which the rates of absorption of $\text{NH}_4\text{-N}$ were high. High proportions of amino nitrogen were included in the basic nitrogen in the roots of those plants which were grown in solutions of high pH and which contained high concentrations of $\text{NH}_4\text{-N}$ and amino nitrogen.

" $\text{NO}_3\text{-N}$ accumulated in extremely high concentrations in the stems as compared with the roots and leaves, but the small variation in concentration of $\text{NO}_3\text{-N}$ in the roots with variation in pH of the culture medium was paralleled by a relatively small variation in concentration in the stems and leaves. Since no greater accumulation of $\text{NO}_3\text{-N}$ in the plants resulted from high rates of absorption of $\text{NO}_3\text{-N}$ than from low, it is evident that the pH range which favored the most rapid rate of absorption of $\text{NO}_3\text{-N}$ also favored the most rapid

assimilation of $\text{NO}_3\text{-N}$. The concentration of $\text{NH}_4\text{-N}$ in the tops was comparatively low, and for plants of a given age there was no significant difference in this respect between plants grown in solutions of different pH, despite the differences found in the roots. Since no greater accumulation of $\text{NH}_4\text{-N}$ than in the tops of the plants resulted from high rates of absorption of $\text{NH}_4\text{-N}$ than from low, and since high concentrations of amino nitrogen in the roots accompanied high concentrations and high rates of absorption of $\text{NH}_4\text{-N}$, it is apparent that the pH range which favored the most rapid rate of absorption of $\text{NH}_4\text{-N}$ also favored the most rapid assimilation of $\text{NH}_4\text{-N}$."

A method for determining the capacity of a soil to fix phosphorus in difficulty available form, A. F. HECK (*Soil Sci.* 37 (1934), No. 6, pp. 447-482, fig. 1).—Noting that "the outlines of this method were furnished A. R. Midgley of the Vermont Experiment Station and were used by Weiser [E. S. R., 70, p. 22] of that station in a very recent work in which he reports obtaining very satisfactory results with Vermont soils," the author of this contribution from the Wisconsin Experiment Station briefly describes a procedure in which 0.5 g of soil is treated with 0.2 mg (400 p. p. m.) of phosphorus as monocalcium phosphate in solution in 50 cc of water, and the suspension is evaporated to dryness, the readily available phosphorus being then determined by means of 0.002 N sulfuric acid buffered to pH 3. This amount, subtracted from the sum of what was added and present in the soil before treatment, gives the amount fixed, which makes it possible to calculate the capacity of the soil to fix phosphorus in difficultly available form."

Results given by this method compared favorably with those obtained under field conditions. The time required in the field for a soil to attain the fixation percentage indicated by this method was observed to become proportionately greater as the capacity of the soil for fixation increased.

A comparison of superphosphate and raw rock phosphate on different types of soil, A. W. BLAIR, A. L. PRINCE, and S. H. WINTERBERG (*Soil Sci.*, 37 (1934), No. 6, pp. 483-491).—Three types of soil (Colts Neck loam, Sassafras loam, and Portsmouth loam) were used by the authors of this contribution from the New Jersey Experiment Stations in a cylinder comparison of superphosphate with rock phosphate for growing potatoes, grain, corn forage, and soybeans, complete fertilizer being used in all cases except in the check cylinders, from the treatment of which phosphoric acid was entirely omitted. Superphosphate was used at rates to give 100, 200, 500, and 1,000 lb. to the acre, and rock phosphate in equivalent amounts. A series with lime and without lime was provided for each type of soil and for both phosphate treatments.

Results on each individual soil type are recorded. As a general conclusion from the experiment as a whole, it was found that "with conditions similar to those under which this work was carried out, it would seem to be a waste of money to use any form of phosphate on strongly acid soils or on soils such as Colts Neck loam and Portsmouth loam, which are naturally well supplied with phosphorus.

"Lime applied to such soils increases the availability of the natural phosphates and also the effectiveness of applied fertilizers."

Soil acidity and liming [trans. title], N. F. VASQUEZ (*Min. Fomento, Dir. Agr. y Ganaderia* [Peru], *Circ.* 20 (1933), pp. 5-15, figs. 2).—This is a semi-popular discussion of the subject, the topics taken up being the nature and causes of soil acidity, types of acidity, effects of soil acidity, relative tolerance of plants to soil acidity (a table of relative plant sensitivity to soil acidity, included under the last-named heading, indicates especially plants very sensitive to soluble aluminum, on the one hand, and, on the other, plants

exceptionally tolerant of acid soil), and the determination of soil acidity. Under the general caption The Liming of the Soil are considered the nature of limes, the effects of liming, the determination of the quantity of lime which should be applied, the buffer action of the soil, and (very briefly) the time and method of the application of the lime.

Response of Illinois soils to limestone, F. C. BAUER (*Illinois Sta. Bul. 405* (1934), pp. 301-363, figs. 27).—The long-time experiments on 40 experimental fields summarized and discussed in this bulletin indicated an inverse relation, *ceteris paribus*, between natural productivity and response to limestone applications. Increases in crop yield induced by liming varied from nil to more than 150 percent. Response to limestone applications was found to be related to various chemical characteristics of the soil, including the ratio of the replaceable calcium and magnesium content of the total base-exchange capacity. Soils of a calcium and magnesium content amounting to about 80 percent of the saturation value showed little response. The usefulness for the rapid determination of lime requirements of the performance of suitable chemical tests is emphasized. Other conclusions are summarized, in part, as follows:

"Different crops respond differently to limestone applications. On the dark-colored soils the response of the corn, oats, wheat, and hay crops was somewhat similar, though oats tended to be the least responsive. On the light-colored soils wheat made a much better response than corn, though all crops, especially hay, made large responses. On sandy soil the differences between the corn and wheat responses were not great; and both crops showed better responses on this soil than on the dark-colored soils. On the sandy soil the application of limestone made the difference between good hay yields and no yields at all. The use of limestone on the light-colored soils has tended to raise the productive levels of such soils to about 50 percent of the levels of the better untreated dark-colored soils. The combined influence of organic manures and limestone has raised the light-colored soils to levels approximately 60 percent as high as the better untreated dark-colored soils.

"Soils that have shown a high response to limestone applications have tended to show that response quickly. Soils that have shown only a moderate response have tended to be somewhat slow in evidencing that response, though they usually have shown considerable acceleration in response after the first or second rotation. Some highly productive soils have shown no response until recent years, indicating that there has been a slow development of lime deficiency. Some soils, after exhibiting considerable acceleration in their response for a number of years, have then shown a leveling out of response and then a falling off. Such behavior is probably due to increasing deficiencies in the supplies of other plant nutrients. On many soils increases from limestone have continued for some years after applications have been discontinued, showing the cumulative effect of proper applications of limestone. . . .

"Limestone should be applied in amounts meeting rather closely the actual crop requirements. Smaller amounts may be altogether without effect. Larger amounts will be not only uneconomical but they may tend to reduce the availability of other plant nutrients, such as phosphorus and potassium."

Specific examples of some of the general observations stated are given.

Liming western Oregon soils, R. E. STEPHENSON and W. L. POWERS (*Oregon Sta. Bul. 325* (1934), pp. 20, figs. 7).—The content of Bulletin 237 has been revised with some additions (E. S. R., 61, p. 20).

Need and use of lime on Vermont soils, A. R. MIDGLEY and V. L. WEISER (*Vermont Sta. Bul. 371* (1934), pp. 32, pls. 4, fig. 1).—An investigation of the need of Vermont soils for lime and of the means whereby it may be applied

most economically is recorded. Chemical tests were made, plant responses in greenhouse and field plats were studied, and leaching losses, soil acidity changes, and crop growths when lime was applied at different rates were determined.

Small applications proved more effective per unit used than did larger dosages. Lime-leaching losses increased roughly in proportion as the amounts applied were increased. Small applications brought about greater pH changes per unit of lime than occurred when heavier ones were made. Larger crop responses per unit of lime were always secured when applications were made at the lower rates.

It was observed that some crops were severely damaged when large lime applications were used on certain acid soils, whereas such injuries never occurred on neutral or basic soils similarly limed. Such possible causes of overliming injury as decrease in the available plant nutrients, increased basicity, the presence of soluble iron, aluminum, calcium, and other salts in the soil, as well as of toxic organic compounds, were studied in considerable detail.

"The injurious effects caused by overliming tend to disappear as time elapses. They were completely overcome on some soils after the first crop was removed, but in other cases two or three croppings were necessary before normal conditions were established. No crop injury could be produced when calcium silicate or certain dolomitic limestones were used instead of calcium carbonate, oxide, or hydrate, although they proved to be as effective as was calcium carbonate in reducing soil acidity. Calcium silicate, large amounts of fresh barnyard manure, as well as heavy applications of superphosphate, were very beneficial in reducing the damage to crop growth produced by overliming with calcium carbonate. Certain cultural practices may also reduce the injury, such as frequent light applications of lime in lieu of one large dosage, or applying the amendment a season or two ahead of the sowing of the susceptible legume crop. In general it seems advisable to use small and frequent dosages of lime."

Commercial fertilizers, H. R. KRAYBILL, O. W. FORD, O. S. ROBERTS, L. E. HORAT, M. H. THORNTON, C. M. COHEE, and J. W. JACKMAN (*Indiana Sta. Circ. 202 (1934)*, pp. 16, fig. 1).—The 1933 fertilizers as a whole had average plant food contents totaling 21.9 percent. More than 37 percent of the total tonnage was of the 2-12-6 grade. The circular includes the usual summarized report of the 1933 inspection.

Analyses of commercial fertilizers, H. E. CURTIS, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Bul. 336 (1932)*, pp. 395-495).—This is the 1932 report of fertilizer analyses.

Analyses of commercial fertilizers (*South Carolina Sta. Bul. 297 (1934)*, pp. 38).—This bulletin is the usual report of analyses of 1,037 samples of fertilizer, covering the season 1933-34.

Commercial fertilizers, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 381 (1934)*, pp. 18).—Reporting for 1934 the usual analytical information and purchasers' advice, this bulletin notes also that brands carrying from 16 to 24 units of plant food were of the most frequent occurrence, and that only 6 out of 91 brands carried less than 15 units.

AGRICULTURAL BOTANY

Some improvements in auto-irrigator apparatus, L. A. RICHARDS and H. L. BLOOD (*Jour. Agr. Res. [U. S.], 49 (1934)*, No. 2, pp. 115-121, figs. 4).—To overcome the difficulty of preventing air leaks in prevailing types of 2-piece double-

walled irrigator pots, a 1-piece double-walled pot was devised. The mode of construction is described and illustrated. Such pots may be operated singly or in groups connected by a common distributing pipe with an overhead container that draws water from a constant level reservoir. Any air in the system automatically passes to the overhead reservoir and may be aspirated out.

The tension of the water is controlled in the pots by varying the water head or the amount of mercury inserted in the supply line. The capillary conductivity of the soil, the capillary conductivity of the porous pot wall, the proportion of the soil to the water-supplying surface, and the rates of evaporation and of transpiration influence the precision of control obtainable with this system.

This is a joint contribution from the Utah Experiment Station and the U. S. D. A. Bureau of Plant Industry.

[Plant physiological studies in New Jersey] (*New Jersey Stas. Bien. Rpt. 1932-33, pp. 66-68*).—Under the department of plant physiology, by J. S. Shive, are briefly summarized the major results of the chief problems investigated during the biennium, namely, ion absorption in relation to plant growth, including the effect of different pH reactions of the culture media on the rates of N absorption, the influence of different pH reactions of the culture media on N assimilation, and on the relation of the pH of plant tissues to Fe availability and distribution in plants; and the salt requirements of representative plants (tomato, peach, blueberry, citrange, rhododendron, rose, snapdragon, carnation, and others).

Utilization of nutrients by Colonial bent (*Agrostis tenuis*) and Kentucky bluegrass (*Poa pratensis*), H. B. SPRAGUE (*New Jersey Stas. Bul. 570 (1934), pp. 16*).—To throw light on some of the ecological problems of grazing lands and turf, the author conducted tests with Kentucky bluegrass and Colonial bentgrass from December to May under controlled greenhouse conditions in pots of washed quartz sand. Modifications of the Tottingham nutrient solutions (E. S. R., 45, p. 733) were added by the drip method three times a week and alternated with distilled water, sufficient ferric phosphate to maintain the normal green color being added in either case. The tops and roots were analyzed.

Both grasses showed similar growth responses in the optimum treatment. Colonial bent was considerably more tolerant of deviations from the optimum than Kentucky bluegrass. With the lowest amount of ammonium sulfate, both grasses absorbed the most N and produced the most growth. Yields fell with increasing amounts of this substance, even with constant total osmotic value of the solutions. Variations in potassium phosphate and magnesium sulfate were of minor importance. Both grasses showed a higher percentage of N when grown with larger amounts of ammonium sulfate, but when absorbed N had accumulated sufficiently in the roots and tops it became toxic and injured growth. In contrast, additions of sodium nitrate greatly stimulated the growth of bentgrass.

The P content of both increased with the supply of phosphate, but the percentage of Mg was very poorly correlated with the supply. With identical solutions the Ca content of Colonial bentgrass was consistently higher than that of bluegrass, but in both species it varied greatly although the Ca quantity was held constant in all solutions.

N recovery was similar when both were grown in the most favorable nutrient solutions, but bluegrass appeared far less capable of utilizing ammonium N in the least favorable solutions (pH 4.8 to 5.1) than bentgrass.

Yields of dry matter were closely correlated with total P recovered in both species, which apparently exhaust available P with equal rapidity. The total

absorption of Ca was consistently greater with Colonial bentgrass, even though it is tolerant to acid soils. Growth of bentgrass was reduced by ammonium chloride and sodium chloride additions about equally. The addition of sodium sulfate did not inhibit bentgrass growth.

Adjusting the reaction to pH 6.5 with sodium hydroxide largely overcame the toxic effects of ammonium sulfate additions, but total growth of bentgrass was not augmented by additional N in this form. Nitrate of soda produced greater growth at about pH 4.5 than with the pH adjusted to 6.5 with sodium hydroxide. Even at pH 6.5, however, nitrate of soda was superior to sulfate of ammonia.

The ratio of root to tops was greatly changed by adjusting the pH, the roots being relatively more abundant in the strongly acid media. Nitrate additions to such solutions, however, greatly stimulated top growth without markedly affecting root development.

The author holds that a rational system of turf fertilization must consider the species of grass present, and apply such knowledge as that *P. pratensis* is more sensitive than *A. tenuis* to excess ammonium N, that both fail to assimilate this in liberal amounts under strongly acid conditions, and that the tops increase at the expense of the roots when the plant is able to utilize N liberally.

Normal crops and the supply of available soil manganese. B. E. GILBERT (*Rhode Island Sta. Bul.* 246 (1934), pp. 15).—The results are reported of studies extending over several years on the cause and correction of that type of chlorosis of various crop plants which is linked with a deficiency of available soil Mn. The principal contributions to this problem by other investigators are also discussed. The characteristic symptoms are described. The variations in symptoms are held to depend on the degree to which the chlorophyll disappears and on the color of the remaining pigments. The green color was found to persist longest along the principal veins, while in severe cases bleached necrotic areas may appear between them.

Mn chlorosis was definitely connected with soil alkalinity. In Rhode Island the critical range seemed to lie between pH 6.8 and 7.6, though the point at which injury began was found to vary with the crop and climate. It could not, however, be linked with soil type. Crops differed greatly in their susceptibility. Spinach was very sensitive. Tomatoes were much less so. Mn deficiency apparently caused decreased yields in corn, lettuce, onions, and mangels without the development of visible chlorotic symptoms. Available data suggest that cooler temperatures, causing slower growth, may enable crops in certain years to withstand injury.

Mn deficiency was readily corrected in the tests either by spraying the plants with Mn sulfate at the rate of 8 lb. per acre or by mixing it with fertilizer at the rate of 30 lb. per acre, in which case there was little evidence of persistence of the benefit with the next year's crop. Tests indicated that Mn chlorosis may also be prevented by the use of sulfate of ammonia or other means of counteracting the effects of excessive liming. Manure appeared to prevent the trouble in some cases.

No indication was found that Mn chlorosis of spinach was consistently connected with low vitamin A content as compared with normal plants.

On photosynthesis and free nitrogen assimilation by leguminous plants. E. B. FRED and P. W. WILSON (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 7, pp. 403-409, figs. 3).—The results are reported of experiments conducted at the Wisconsin Experiment Station in which the carbohydrate supply in leguminous plants was modified by varying their photosynthetic and respiratory activities through control of the available supply of light, O₂, and CO₂. The available

N supply was modified by raising or lowering the percentage of atmospheric N or by changing the nitrate supply in the soil.

The authors conclude that N fixation by leguminous plants is usually limited by the carbohydrate synthesis in the plant, which, due to the low percentage of CO₂ in the air, is rarely sufficient to allow maximum development of the nodules. This limitation in the growth of the nodules is usually accompanied by a limitation in the quantity of N fixed. If carbohydrate synthesis is increased, the number of nodules likewise increases. The size of nodules increases only if the other factors, e. g., percentage of O₂ or N, are not restricting N fixation.

Nodule distribution is considered as a probable manifestation of the carbohydrate level in the plant. The surplus carbohydrate available to the bacteria which enter the lateral roots may normally be too small to allow the development of nodules at many of the points of invasion. Competition for carbohydrate may also cause the observed small numbers of nodules to develop from the much more numerous points of invasion on the primary root. Any factor that tends to raise the carbohydrate level causes the increased formation of nodules at invaded points. The detrimental effects of the application of combined N on nodule formation can be explained, at least in part, by the consequent lowering of the carbohydrate level in the plant through synthesis of protein. If the carbohydrate level is raised, however, as by growing the plant in an atmosphere containing additional CO₂, the effects of adding combined N are to some extent overcome.

A study of *Rhizobium* species in relation to nodule formation on the roots of Florida legumes, I. W. R. CARROLL (*Soil. Sci.*, 37 (1934), No. 2, pp. 117-135, figs. 4).—Forty-one new leguminous plant species representing 14 genera were investigated as to cross-inoculation relationships and assigned to groups as follows: Group 1 (pea) *Lathyrus tingitanus*; group 2 (clover) *Trifolium carolinianum*, *T. procumbens*, and *T. reflexum*; group 5 (cowpea) *Apios tuberosa*, *Aeschynomene americana*, *Clitoria ternatea*, *Erythrina herbacea*, *Lespedeza sericea*, *L. stipulacea*, *Desmodium triflora*, *Mimosa strigillosa*, *Crotalaria alata*, *C. anagyroides*, *C. axillaris*, *C. falcata*, *C. goreensis*, *C. hildebrandtii*, *C. incana*, *C. intermedia*, *C. juncea*, *C. lanceolata*, *C. Maxillaris*, *C. mundayi*, *C. mysorensis*, *C. oocarpa*, *C. polysperma*, *C. rotundifolia*, *C. spectabilis*, *C. striata*, *C. usaramoensis*, *C. valetonii*, *C. vallicola*, and *C. verrucosa*; group 19 *Lupinus diffusus* and *L. villosus*; group 20 *Vicia acutifolia* and *V. floridana*; group 21 *Wistaria chinensis*; and group 22 *Pithecolobium dulce*. The last 4 are new groups established on the basis of failure to obtain nodule development after inoculation with cultures from 14 previously established groups.

The group relationships of the plant species investigated by previous workers and the author are presented in a table. Irregularities in nodule formation are pointed out in some of the larger cross-inoculation groups, particularly in the cowpea group. It is concluded that the present-day conceptions of, and practices in, legume group inoculation are illogical and unsound and should be revised.

The comparative growth rates of *Rhizobium meliloti* and *Rhizobium japonicum*, I, II. R. H. WALKER, D. A. ANDERSON, and P. E. BROWN (*Zentbl. Bakt. [etc.]*, 2 Abt., 86 (1932), No. 19-26, pp. 433-443; 87 (1932), No. 1-4, pp. 27-44, figs. 22).—This is a contribution from the Iowa Experiment Station.

I. Qualitative studies.—It is reported that a number of tested isolates of *R. meliloti* and *R. japonicum*, along with a few other strains of legume organisms, were grown in liquid media and their growth rates compared by esti-

inating the degree of turbidity produced. *R. meliloti*, *R. phaseoli*, and *R. trifolii* produced turbidity quickly and in large amounts, while *R. japonicum*, *R. lupini*, and cowpea bacteria produced turbidity very slowly. No significant differences in rate of turbidity production were noted between different isolates of the same strain of bacteria. The rate was similar also, regardless of whether mannitol or sucrose was present in the medium.

II. *Quantitative studies*.—The comparative growth rates of two isolates each of *R. meliloti* and *R. japonicum* were tested by using liquid media and determining the numbers of viable organisms at intervals by the agar plate counting method.

In most cases the organisms grew slightly faster in the glucose media than in the mannitol media when the nitrogen content was the same. The rate of growth was also slightly faster in the presence of nitrate nitrogen than without added nitrate, irrespective of the carbohydrate used.

The generation time of *R. japonicum* was found to be about twice as long as that of *R. meliloti*. For example, in glucose medium without nitrate nitrogen the generation time of *R. meliloti* was 3.21 hr. and that of *R. japonicum* 6.09 hr. The data support earlier studies which indicate that the alfalfa root nodule bacteria grow considerably faster than the soybean bacteria.

The Fungi Imperfecti: Order Sphaeropsidales, with keys and references for the genera, H. B. BENDER (*North Woodbury, Conn.: Author, 1934, pp. 52*).—The author has prepared compact dichotomous keys for 568 genera of the Fungi Imperfecti belonging to the order Sphaeropsidales. The work is apparently based, to a considerable extent, on a study of the literature. A separate key is given for each of the four families recognized. A bibliography to the original descriptions of the included genera and synonyms is appended. The author intends to publish keys to the other orders.

Resistance of fungous spores to low temperatures, C. J. ALEXOPOULOS and J. DRUMMOND (*Ill. State Acad. Sci. Trans., 26 (1934), No. 3, p. 63*).—Spores from cultures of *Melanconium fuligineum*, *Coniothyrium* sp., *Eurotium herbariorum*, and *Cytospora chrysosperma* were exposed for 1 hr. to the temperature of liquid air (about -185° C.). Normal germination and growth took place afterward on corn meal agar in all cases. Mycelium of certain fungi similarly treated failed to grow.

The first results of studies on protozoa of the moorland soils of Lombardia (Lombardy) [trans. title], R. and L. GRANDORI (*Ricerca Sci. [Roma], 1 (1934), No. 8, pp. 415-422*).—The protozoa of three types of Lombardia moorland (pinetum, robinietum, and callunetum) were studied for 1 yr. Different groups of protozoan species were found in different types of land, robinietum giving a particularly rich fauna.

The authors conclude that such differences are due to the nature of the dominant plant, which induces differences by means of its remains that decompose on the ground. Recent treatment of reclaimed moorland soil with stable manure and lime appeared to cause the development of a special group of protozoan species.

The accessory factor necessary for the growth of *Nematospora gossypii*, I-III (*Biochem. Jour., 25 (1931), No. 5, pp. 1656-1673; 27 (1933), No. 6, pp. 1859-1868*).—Three papers are reported.

I. *The chemical nature of the accessory factor*, H. W. BUSTON and B. N. PRAMANIK (pp. 1656-1670).—As in the case of yeast, it was found that an accessory factor is required by *N. gossypii* for normal growth on synthetic media. This fungus was unable to assimilate simple nitrogenous compounds unless supplied with this factor, which was found to be associated with crude

proteins from various sources and to be present in extracts from lentils and etiolated lupine seedlings. Less activity was shown by extracts from cotton leaves, potatoes, and yeast.

"The accessory factor yields two components on precipitation with barium hydroxide and alcohol; neither alone is active, the presence of both fractions being necessary. The active substance [thus precipitated] can be replaced in the medium by small amounts of inositol. The active substance . . . not precipitated [in this way] is precipitated by mercuric acetate and sodium carbonate.

"Inositol has been isolated from the baryta precipitate; . . . the [remaining] fraction . . . is inactive." Inositol intensifies the activity of certain relatively inactive substances like marmite, the lack of activity of which is therefore considered to be due to a deficiency of inositol. The latter material, however, is not considered to act in the way Reader found mannitol to act in promoting growth of *Streptothrix corallinus* (E. S. R., 62, p. 94).

II. *The relation of the accessory factor to "bios"*, H. W. Buston and B. N. Pramanik (pp. 1671-1673).—The growth-promoting accessory factor necessary for *N. gossypii* was found in association with bios among natural products, but the two substances did not appear to be identical. Inositol was devoid of true bios activity, but was essential for the growth of this fungus.

III. *The preparation of concentrates of the second accessory factor*, H. W. Buston and S. Kasinathan (pp. 1859-1868).—By precipitation successively with mercuric acetate, barium hydroxide, and phosphotungstic acid, followed by extraction from acid solution (after mild hydrolysis) with butyl alcohol, the second factor is obtained as a concentrate active in doses of 1.2 mg per 100 cc of medium in the presence of 20 mg of inositol.

The active substance occurs naturally in combination with an inactive nitrogenous base and possesses weak acidic properties.

Phylogenetic taxonomy of plants, J. H. SCHAFFNER (*Quart. Rev. Biol.*, 9 (1934), No. 2, pp. 129-160, figs. 2).—After a brief résumé of the development of plant taxonomy and particularly of the phyletic viewpoint, this contribution from the Ohio State University points out that "botanical science has at last advanced far enough that a rather conclusive taxonomy can be established on a true evolutionary basis."

A series of 21 principles and dicta are set down as the basis of the author's taxonomic procedure. Ten fundamental progressive stages in the evolution of plants are discussed. A synopsis of the 15 plant phyla, in the form of an analytical key, is followed by synopses of the classes and subclasses under each phylum. The diagram of a phylogenetic tree is presented, on which the classes and subclasses are arranged.

After a consideration of the segregative and progressive movements in the Anthophyta, a synopsis of the orders of this phylum is given, arranged by subclasses and illustrated by a detailed diagram.

The author lists a direct cumulative series of 101 fundamental hereditary potentialities culminating in the dandelion. He presents another series culminating in Indian corn (*Zea mays*), a third in *Dictyophora*, and a fourth in *Spirogyra reflexa* as examples of the way in which phylogenetic evolution is believed to proceed by the addition of potentialities, step by step.

Eelgrass disappearance has serious effects on waterfowl and industry, C. COTTAM (*U. S. Dept. Agr. Yearbook 1934*, pp. 191-193, fig. 1).—In view of the sudden and nearly complete dying out of eelgrass (*Zostera marina*) along the Atlantic coasts of North America and Europe, the author discusses the importance of this plant to waterfowl and aquatic life, generally, and its economic uses. A brief account is given of its disappearance and the resulting situation.

GENETICS

Embryology and genetics, T. H. MORGAN (*New York: Columbia Univ. Press, 1934, pp. IX+258, figs. 129*).—A description of the development of the ovum and embryo in both asexual and sexual reproduction, with many examples and illustrations drawn from various biological species and having special reference to the application and relationship to genetics.

Chromosome number and meiotic behavior in *Gossypium*, J. M. WEBER (*Jour. Agr. Res. [U. S.], 49 (1934), No. 3, pp. 223-237, figs. 14*).—Cytological studies confirmed the reported haploid chromosome number of 13 for all Asiatic cottons, for wild American species of *Gossypium*, and for *G. sturtii*, and of 26 for all cultivated American cottons. *G. darwinii* was found to have 26 haploid chromosomes and *G. kirkii* approximately 24 diploid chromosomes. Although a few bivalents in cultivated cottons are attached by interstitial chiasmata, most are attached by 1 or 2 terminal or subterminal chiasmata. The wild American species and *G. sturtii* appear to exhibit only terminal or subterminal chiasmata and normal meiotic behavior. Occasionally in cultivated American cottons from 1 to 5 quadrivalents are formed. Counts of chromosomes and behavior during the homotypic division show that spores of cultivated cottons occasionally have less and rarely more than the characteristic haploid number. The chromosomes within a cotton species evidently are heterogeneous in shape and very nearly equivalent in size. While there is evidence that the species having 26 pairs are of tetraploid nature, the final proof of this tetraploid nature and the consequent phylogenetic interpretations appear to rest upon the type of pairing that occurs in American-Asiatic cotton hybrids.

American wild cottons with thirteen chromosomes, T. H. KEARNEY (*Jour. Heredity, 25 (1934), No. 8, pp. 305-312, figs. 4*).—The characteristics and possible relationships of *Gossypium klotzschianum*, *G. davidsonii*, *G. harknessii*, and *G. armourianum*, all lintless species of cotton, are described with a determinative key.

Anomalous segregation of a triploid tomato, C. L. HUSKINS (*Jour. Heredity, 25 (1934), No. 7, pp. 281-286, figs. 3*).—From a triploid tomato originally developed at the John Innes Horticultural Institution, England, there were obtained at McGill University 22 seeds from which were raised 11 plants, all tetraploid. The possibility that a branch on the triploid had changed its chromosome complex is suggested.

Studies in North American violets.—IV, Chromosome relations and fertility in diploid and tetraploid species hybrids, H. C. BOLD and A. GERSHOY (*Vermont Sta. Bul. 378 (1934), pp. 64, pls. 15*).—This, the fourth in a series of papers relating to the genetics of the violet (*E. S. R.*, 71, p. 760), discusses the results of a study of the maturation divisions in diploid and tetraploid species hybrids. In each set of crosses the reciprocal hybrids resembled each other rather closely. The diploid hybrids were partially fertile and the tetraploid fully sterile and feebly parthenocarpic. Maturation divisions in the diploid hybrids were predominantly normal and in the tetraploid highly abnormal. Instances of complete pairing of chromosomes were observed in the tetraploids, but normal sporogenesis did not take place and the typical pollen grains were observed to be morphologically imperfect and physiologically impotent. A precocious degeneration of the flower buds usually accompanied and often preceded the abnormal maturation divisions, suggesting that the failure in the divisions may be interpreted on the basis of disturbed morphogenetic processes in the flower buds.

The bull index problem in the light of modern genetics, J. L. LUSH (*Jour. Dairy Sci., 16 (1933), No. 6, pp. 501-522, fig. 1*).—An attempt is made to

clarify the genetic basis for bull indexes. The author points out that special emphasis must be placed on the production of the daughters, and recommends the equal parent index in which daughters' average plus the increase of the daughters over their dams serves as a basis of measurement as the method proven soundest in principle and relatively easy to calculate. The possibility of weaknesses in this method playing an important part is also noted.

Descent and origin of the Afrikaner cattle. H. EPSTEIN (*Jour. Heredity*, 24 (1933), No. 12, pp. 449-462, figs. 6).—A description is given of the origin of Afrikaner cattle, from which it is concluded that the cattle of the Hottentots formed the nucleus of the breed and that such cattle were descended from Zebu cattle brought by the Semitic nomads from Ethiopia to Egypt and other parts of Africa 3,000 to 4,000 years ago.

Attention is called to the development of sheep in Africa and the replacement of the thin-tailed sheep of the Hamites in Egypt by the fat-tailed sheep of the Semites, the descendants of the Asiatic *Ovis arkal*, probably at about the same time the Zebu cattle were introduced.

Linkage tests in poultry.—I. W. LANDAUER (*Biol. Gen.*, 8 (1932), No. 1, pp. 219-226).—Studies of linkage relations of several characters in poultry by back-crossing heterozygous birds to double recessives at the [Connecticut] Storrs Experiment Station showed that the following pairs of characters were independently inherited: Creeper and single comb, frizzle and single comb, bare neck and frizzled plumage, and bare neck and single comb. Duplex comb was determined by one factor dominant to single comb with the probable operation of one modifying factor.

Linkage tests in poultry.—II, Linkage of the rumpless gene. W. LANDAUER (*Jour. Heredity*, 24 (1933), No. 7, pp. 293, 294).—Studies were made of the linkage relations between rumplessness and the characters for crest and frizzle, based on matings made at the [Connecticut] Storrs Experiment Station. A random distribution was obtained in all four classes when cockerels heterozygous for rumplessness and crest were mated to normal White Leghorn pullets. However, two cockerels heterozygous for rumplessness and frizzled plumage, when mated to normal White Leghorn pullets, produced 117 rumpless frizzles, 89 rumpless normals, 101 normal rump and frizzle, and 142 normal rump and normal plumage offspring. These data indicate 42.3 percent of recombinations and therefore suggest linkage of the genes for rumplessness and frizzled plumage.

Attention is called to the fact that others have reported linkage between frizzled plumage and crest, and if such is the case there must be linkage between rumplessness and crest, but these factors are evidently at opposite ends of the chromosome or on different chromosomes.

Light-phase Mallard ducks. R. G. JAAP (*Jour. Heredity*, 24 (1933), No. 12, pp. 467-472, figs. 3).—A study is reported from the Wisconsin Experiment Station of the mode of inheritance of the character "light phase" in Mallard ducks. "Light phase" was found to be a recessive factor which produced a lighter color in the allelomorphs of the Mallard series, including several other variations. With a single exception, *li li* × *li li* matings produced "light phase" offspring only, while *Li Li* × *Li Li* matings produced all normals. The expected ratios were closely approximated in the F_2 and back-cross progeny.

The influence of the "light phase" factor on dusky (m^d) and restricted (MR) are described, including the phenotype expected in ducks of different genotypes.

The normal and experimental development of the mammary gland (*Missouri Sta. Res. Bul.* 207 (1934), pp. 35, figs. 37).—Two papers are presented as follows:

I, *The male and female domestic cat*, C. W. Turner and W. R. DeMoss.—Experiments on the development of the mammary gland in cats indicated that the estrogenic hormone will stimulate growth of the duct system in male and female gonadectomized animals in an approximately equal manner. Marked stimulation of the lobule-alveolar system followed the simultaneous administration of 1 rabbit unit of corporin and 25 rat units of theelin for 20 days. Six daily administrations of 2 cc of galactin, following the above treatment, caused the stimulation of milk secretion comparable to that observed in normal females at the time of parturition. Following weaning, lactation was quickly inhibited and a gradual involution of the lobule-alveolar system occurred for about 80 days, at which time only the duct system remained.

II, *The male and female dog*, C. W. Turner and E. T. Gomez.—A detailed description is given of the changes in the mammary gland of bitches during pregnancy and pseudopregnancy. Only slight growth of the duct system was stimulated in ovariectomized male and female dogs by daily injection of from 100 to 200 rat units of the estrogenic hormone for periods of from 20 to 35 days, from which it is suggested that insufficient amounts of the hormone were injected. Hysterectomy was found not to interfere with the growth of the lobule-alveolar system during pseudopregnancy. When such development had occurred in virgin pseudopregnant bitches, it was found that the animals responded rapidly to the lactogenic hormone.

The causes of the growth and function of the udder of cattle, C. W. TURNER (*Missouri Sta. Bul.* 339 (1934), pp. 20, figs. 17).—A brief account is given of the development of the mammary gland in dairy cattle in preparation for milk secretion, indicating the role of the hormones, estrin, corporin, and galactin in inducing these changes.

Lactation in a barren heifer, I. JOHANSSON and M. H. KNUDSEN (*Jour. Dairy Sci.*, 16 (1933), No. 6, pp. 523-528, fig. 1).—A case of lactation in a barren Jersey-Angus heifer at the Wisconsin Experiment Station is noted. Milk secretion started at the age of about 3 years and continued for about 630 days. Prior to the starting of milk secretion the heifer had evidently been suckled by calves running with her. The maximum daily yield was 18.7 lb., and the total yield was 5,011.9 lb. of milk, which, on chemical analysis, seemed normal.

Results of transplanting gonadal tissue in dairy cows and bulls, F. W. MILLER, R. R. GRAVES, and G. T. CREECH (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 3, pp. 259-278, figs. 12).—Accounts are given of the results of transplanting cattle and pig ovaries into the muscle tissue of 11 Jersey and Holstein-Friesian cows, and bull and pig testicles into the muscle tissue of 5 bulls at the U. S. Animal Husbandry Experiment Farm, Beltsville, Md. Difficulties in the reproductive ability of these animals had been noted. The results showed that transplantation of the ovarian tissue had no appreciable effect on the estrous cycle or the production of ova, and that practically no damage was done to pregnant cows. No appreciable effects on the spermatozoa production of senile bulls resulted from the transplantation of testicular tissue, although some increase in appetite, body vigor, and aggressiveness was noted.

The spermatozoa of a 6½-year-old bull became temporarily active and fertility followed the grafting of 4 pieces of a pig testicle on the left trapezius thoracalis muscle. The grafts were completely resorbed at slaughter, about 6 months after the operation.

Oestrogenic hormone in the urine of the stallion, B. ZONDEK (*Nature [London]*, 133 (1934), No. 3361, p. 494).—Studies of the estrogenic properties of the urine of stallions indicated, in experiments with guinea pigs, that the same influence on the secondary sex characters was exhibited as has been produced by the follicular hormone.

The relationship of the male and female hormones is discussed. It is considered that the male hormone represents an intermediate product in the formation of the female hormone, and the female hormone occurs in the male organism as a degradation product of the male hormone.

A study of the pituitary factor increasing the ovarian weights of immature rats when injected in combination with pregnancy urine, S. L. LEONARD (*Amer. Jour. Physiol.*, 108 (1934), No. 2, pp. 331-340).—Immature female rats 22 to 24 days of age were injected daily for 4 days with a pregnancy urine extract, extract of the anterior lobe of the hypophysis freed of the growth hormone, and a combination of the two to study the influence on the growth of the ovaries. The combination of pregnancy urine extract and extract of sheep hypophysis brought about increases of from 104 to 790 percent in the weight of the ovaries above the growth produced by the two hormones injected separately. The use of beef hypophysis in the combination produced less stimulation, while human hypophysis extracts produced still smaller increases.

Superfetation in the albino rat, J. R. SLONAKER (*Amer. Jour. Physiol.*, 108 (1934), No. 2, pp. 322, 323).—Two cases of superfetation in the rat are noted in which the birth of litters occurred 14 and 15 days apart, respectively. These results are taken to substantiate the occurrence of ovulation during gestation coincidentally with the peaks of the spontaneous activity which have been observed occasionally in female rats during gestation.

FIELD CROPS

[Field crops research by the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1934*, pp. 167-170, 174, 175, 313, 314, 334-337, figs. 2).—Recent developments and features of certain lines of agronomic research are described in brief articles entitled Cotton of Egyptian Type Is Noncompetitive Crop for West's Irrigated Lands, by T. H. Kearney (pp. 167-169); Cotton-Volume Reduction Should Be Supplemented by Quality Improvement, by O. F. Cook (pp. 169, 170); Crested Wheatgrass Useful in Northern Great Plains Pasture, by C. R. Enlow and H. L. Westover (pp. 174, 175); Seed Generally Will Not Stand Both High Moisture and Warmth, by E. H. Toole and E. Brown (pp. 313, 314); and Sugar-Beet Seed Grown Successfully in America by Overwintering in Field, by E. W. Brandes and G. H. Coons (pp. 334-337).

Field crops [for the Imperial Valley], S. W. COSBY and L. G. GOAR (*California Sta. Circ. 334* (1934), pp. 44-87).—Adaptations and yields are described, and cultural and harvest practices, based on experiments by the Imperial Valley Substation, are recommended for alfalfa, beans, clover, sweetclover, cowpeas, chickpeas, field peas, peanuts, soybeans, vetch, miscellaneous legumes, barley, corn, oats, grain sorghum, sorgo, rice, wheat, castor-beans, cotton, flax, hemp, sugar beets and stock beets, grasses, and miscellaneous forage and green manure crops. A planting calendar for the several crops is included (pp. 74-77).

[Field crops research in Idaho, 1933] (*Idaho Sta. Bul. 205* (1934), pp. 10, 22-26, 60-64, 65, 66, 68, 70, 71-74, figs. 7).—Agronomic experiments (E. S. R., 69, p. 788) reported on from the station and substations included breeding work with wheat and oats; variety trials with oats, winter and spring wheat and barley, alfalfa (E. S. R., 71, p. 37), field peas, soybeans, and miscellaneous

forage grasses and mixtures; cultural (including planting) tests with alfalfa and red clover for seed, corn, and potatoes; study of winter hardiness of wheat varieties and relation between winter-killing and snow scald; inoculation and germination studies with field peas; fertilizer trials with wheat, alfalfa for hay, red clover for seed, and potatoes; treatment of alfalfa with gypsum and sulfur; control of whitetop by tillage and perennial weeds with sodium chlorate; reseeding of burned-over lands (E. S. R., 71, p. 465); effect of management on the composition of pastures; trials of pasture mixtures; a study of the composition and vitamin content of pasture grasses and alfalfa hay; and crop rotations.

[Field crops experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. REED and H. G. HALL (*Indiana Sta. Circ.* 203 (1934), pp. 8-11, figs. 2).—Average acre yields obtained in variety trials with winter wheat, rye, barley, and oats, and soybeans for hay and seed, and average yields of spring barley, rye, and wheat are again (E. S. R., 69, p. 789) tabulated for several periods. The response of pasture to fertilizers, lime, and manure, and the behavior of pasture mixtures are reviewed briefly.

[Field crops experiments in Kentucky] (*Kentucky Sta. Rpt.* 1933, pt. 1, pp. 20, 21, 24-26, 27-29, 31, 32, 39, 64, 65, 66).—Continued progress is reported from agronomic research (E. S. R., 70, p. 172) at the station and the Robinson and Western Kentucky Substations, including rotation, fertilizer, and variety studies, electrically heated plant beds, and utilization of low grades for commercial products, all with tobacco; breeding work with corn; variety tests with red clover, sorgho for sirup, and wheat; fertilizer trials with sorgho and potatoes; effects of legumes in the rotation on yields of corn and wheat; relation of root reserves to adaptation of red clover; life history and self-fertility studies with bluegrass; the residual effect of legumes on bluegrass sods; and pasture experiments.

[Agronomic experiments in New Jersey], L. G. SCHERMERHORN, W. R. ROBBINS, and H. B. SPRAGUE (*New Jersey Stat. Bien. Rpt.* 1932-33, pp. 50, 51, 77-81).—Continued research with field crops (E. S. R., 67, p. 517) reported on briefly included breeding work with corn, wheat, oats, barley, rye, alfalfa, red clover, alsike clover, velvet bentgrass, and Jerusalem-artichoke; variety tests with corn, wheat, rye, oats, barley, soybeans for hay, alfalfa, red clover (strains), timothy, and annual hay crops; the nutrition of sweetpotatoes in sand culture and the effect of nutrient solutions on sprout production in sweetpotatoes; studies of soil conditions for turf grasses and development of grass roots; trials of pasture mixtures; and cooperative fertilizer experiments with pastures. The place of field crop production in New Jersey agriculture is indicated.

[Field crops research at Rothamsted, 1932] (*Rothamsted Expt. Sta., Harpenden, Rpt.*, 1932, pp. 21-42, 68, 69, 74-77, 108-132, 134, 136-162, 169-226, figs. 2).—Continued agronomic experiments (E. S. R., 68, p. 319), reported on from the station and outlying fields, embraced fertilizer studies with wheat, barley, potatoes, sugar beets, mangels, kale, and grassland; a comparison of manure with nitrogen carriers for crops; fertilized rotations; effects of culture, fertility, variety, and seasonal conditions on quality of barley; relation of grading to the composition of barley; meadow v. fallow for wheat; inoculation of legumes; cultural tests with sugar beets, barley, kale, and potatoes; and trials of forage mixtures. Summaries of station contributions on statistical methods and plat technic are also included.

[The Woburn field experiments, 1932] J. A. VOELCKER (*Rothamsted Expt. Sta., Harpenden, Rpt.*, 1932, pp. 94-106, 133, 135, 163-168).—The yields in the

fifty-sixth year of continuous wheat and barley on Stackyard field are reported as heretofore (E. S. R., 68, p. 319), with accounts of crop rotations, green manuring experiments, and fertilizer experiments with sugar beets and kale. H. G. Miller again describes the operation of the station farm.

Root habits of certain crop plants as observed in the humid soils of New Jersey. N. F. FARRIS (*Soil Sci.*, 38 (1934), No. 2, pp. 87-111, figs. 8).—The root systems of potatoes, red clover, and corn in New Jersey Experiment Stations studies were very much less extensive than those reported from the subhumid and semiarid regions of the Western and Midwestern States. Potato roots were limited to the first foot of soil, and the lateral extent seldom exceeded 1 ft. The root systems of red clover did not penetrate deeper than 3 ft., and corn roots extended no farther than 2 ft. either laterally or vertically. The soil acidity, percentage of organic matter, pore space, and soil texture apparently have little influence on root extension, although the pore space may be important in seasons of high rainfall.

The amount of soil moisture at time of seeding seemed to influence the form of clover root systems to a large degree. The ample rainfall in the region appeared to give plant roots very little stimulus to penetrate to the lower soil layers. The same observation seemed applicable to the supply of mineral nutrients which is coupled with the influence of soil moisture. The higher yields of potatoes from small sets spaced closely appeared due to the more extensive utilization of the soil by the plant roots. Different fertilizer ratios seemed to have little effect on potato root systems. Differences noted in yields might be due to the direct influence of fertilizer on translocation of food to the tubers. Various varieties of corn presented quite different root systems, the plants with the largest top growth generally having the most extensive root systems. Differences in yields and root development of corn receiving different types of cultivation were very slight.

Crop varieties and planting mixtures (*Maryland Sta. Bul.* 362 (1934), pp. 396-399).—Varieties of corn, small grains, and legumes for forage and green manure, and mixtures for hay, emergency hay, and pasture are recommended for different regions and conditions in Maryland.

The grain crops, I. J. F. HOFFMANN, edited by K. MOHS (*Das Getreidekorn. I. Band, Die Behandlung, Trocknung und Bewertung des Getreides. Berlin: Paul Parey, 1931, 2. ed., rev., vol. 1, pp. XII+384, figs. 199*).—Part 1 of this volume, by K. Seidel, deals with the storage of grain with special reference to the ripening process, moisture, temperature, and other conditions; part 2, by K. Mohs, considers the drying of grain and the several types of driers; and part 3, by G. Brückner, treats of the quality characters of grain and their determination, and also deals with the several cereals in detail.

Permanent grass hays for sandy soils. G. EPPLEY (*Maryland Sta. Bul.* 362 (1934), pp. 371, 372).—Experiments and experiences in different situations indicated tall meadow oatgrass and orchard grass for a permanent hay crop for sandy, shale, and gravelly soils of Maryland, i. e., on so-called thin lands. Korean lespedeza seemed satisfactory to mix with these grasses and would add to the feeding value of the second cutting. Alsike clover is recommended for the sandy soils. For a good quality hay, the grasses should be cut not later than full bloom. The hay mixture recommended included orchard grass 10 lb., tall oatgrass 10, and alsike clover 4, or Korean lespedeza 10 lb. per acre.

Alfalfa-timothy hay for the dairy farm.—I, Growing high-grade hay in liberal amounts. M. A. BACHTELL and H. ALLEN (*Ohio Sta. Bul.* 538 (1934), pp. 3-20, figs. 4).—A system permitting one-half or more of the tillable area to remain in meadows, worked out at the Trumbull County Experiment Farm,

comprises meadows, largely clover for the first cutting of the first year, alfalfa-timothy mixture for the first cutting of following years, and alfalfa for the second cutting of all years. A satisfactory seed mixture was alsike 2 lb., red clover 4, alfalfa 6, and timothy 4 lb. Oats was a better companion crop than wheat when the mixture was broadcasted. Limestone enough to bring the soil (Trumbull silty clay loam) to at least pH 6 appeared to be the most important factor in securing such meadows. Other fertility practices were normal. Alfalfa-timothy meadows were very drought-resistant, and when cut before June 15, their heavy hay crops contained as high a protein percentage as some commercial alfalfa. Compared with a 3-yr. rotation of corn, oats, and hay, an equal area in such meadows required less man labor, cost less per acre, and produced more digestible feed nutrients at a lower unit cost.

Supplementary hay crops for Maryland, R. G. ROTHGEB (*Maryland Sta. Bul.* 362 (1934), pp. 368-370).—Comparisons of crops suitable for supplementary roughage suggested fall-sown rye, barley, and wheat for use in late spring, April 15 to about May 10, midseason oats (as Swedish Select) for June 15 to July 1, Sudan grass, silage corn, and soybeans for July and August, and Korean lespedeza for late summer hay. The importance of seeding rate and stage of maturity is shown.

Soil, field-crop, and pasture management for Suffolk and Nassau Counties, New York.—II, **Pasture improvement and management**, D. B. JOHNSTONE-WALLACE ([*New York*] *Cornell Sta. Bul.* 600 (1934), pp. 46-62, figs. 6).—The pasture situation in Suffolk and Nassau Counties (Long Island), N. Y., and the botanical composition and fertility requirements of typical pastures are described. Suggestions are made on management as an improvement measure, seeding and fertilizing pasture, feeding cows on pasture, and on supplementing permanent pasture by grazing meadows, by special crops as sweetclover, Sudan grass, Japanese millet, and soybeans, and by soiling crops.

Growing barley for malt and feed, H. V. HARLAN (*U. S. Dept. Agr., Farmers' Bul.* 1732 (1934), pp. II+14, fig. 1).—Production practices deemed suitable for growing malting barley in different regions of the United States, particularly in the Northern and Eastern States, and also feed barley are outlined, and the requirements of maltsters, the merits of important varieties, and barley diseases are discussed briefly. Varieties and dates and rates of seeding are indicated for 36 States growing the crop.

Common beans (*Vicia faba* L.) [trans. title], V. S. MURATOVA (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant-Breeding)*, 1931, Sup. 50, pp. 298, pls. 3, figs. 75; *Eng. abs.*, pp. 248-285).—This comprehensive monograph on the horsebean or broadbean treats of its origin; history of its cultivation; study of the species and pertinent literature; botanical relationships; heritable characters and their variations; the characteristics and classification of the subspecies, varieties, and forms; and the distribution, production, and consumption of the crop in different countries of the world.

Competitive efficiency and productivity of bluegrass (*Poa pratensis* L.) with partial defoliations at two levels of cutting, L. F. GRABER (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 5, pp. 328-333).—Much larger current production of oven-dried bluegrass was obtained in 1929 at the Wisconsin Experiment Station with frequent and close defoliations than with tall defoliations made at the same time and as often. In 1930, when productivity was measured by three uniform cuttings, bluegrass clipped closely in 1929 was less productive and the weeds were from five to seven times more abundant. However, in-

creased productivity in 1930 of plats with tall clippings in 1929 occurred almost entirely in the first cutting (May 10, 1930). Due to many conditions associated with rapid and abundant accumulation of top growth on such plats, delayed recovery reduced yields of the subsequent cutting that year.

Experiments on iarovizing corn, G. F. SPRAGUE (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1113-1120, fig. 1).—Iarovization of corn consistently reduced the percentage of germination and also resulted in a general reduction in number of visible nodes, in plant height, number of ears, and weight of shelled grain per plant. The slight acceleration of pollen shedding and silking noted in some strains was not considered of agronomic importance. There was no evidence of a darkness requirement for corn.

Effect of failure of pollination on composition of corn plants, A. M. BRUNSON and W. L. LATSHAW (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 45-53).—Samples representing open-pollinated plants of Pride of Saline corn with well-filled and with poorly-filled ears taken in 1930 and 1931, and samples taken in 1931 from two single-cross hybrids grown with and without fertilizer, in which ear shoots of alternate plants were bagged before pollination occurred, were studied in cooperation by the Kansas Experiment Station and the U. S. Department of Agriculture.

Chemical analyses of stalks, leaves, cobs, and grain revealed that when set of grain in corn plants is prevented or reduced by prevention of normal pollination, as may be caused by high temperature or extreme desiccation or both, protein in particular and to a lesser extent nitrogen-free extract tend to accumulate in greater than normal proportions in other plant organs, and that the proportion of fiber is reduced, particularly in cobs and stems. The composition of the cob is influenced more than that of other plant parts, being higher in protein, fat, and ash and lower in fiber in plants with poorly filled ears. Fodder from such plants contained more protein and ash, slightly more fiber, and less fat and nitrogen-free extract than equal weights of fodder from plants with well-filled ears. The analyses indicated that, pound for pound, silage or fodder from a corn crop in which pollination has been prevented is higher in protein and ash content than that from a crop with a full set of grain and is nearly as high in energy values. The acre yield of fodder usually was depressed considerably where normal pollination and grain production were prevented.

Fertilizer evidently did not have much effect on the various parts of the plant, although the fiber content of cobs and stems was lower, the ash content of stems was higher, and the nitrogen-free-extract content of cobs and stems was lower where fertilizer was applied than where it was not.

When to harvest sweet corn stover, D. M. GOSS (*Maryland Sta. Bul.* 362 (1934), pp. 373, 374).—Sweet corn stover allowed to stand for 7 to 10 days after ears were removed for canning was found to contain more of easily digested carbohydrates, especially sucrose, than that harvested immediately after the ears were pulled.

A study of ammonia and nitrate nitrogen for cotton.—II, Influence on fruiting and on some organic constituents, K. T. HOLLEY, T. G. DULIN, and T. A. PICKETT (*Georgia Sta. Bul.* 182 (1934), pp. 30, figs. 12).—The continuation of a comparative study of ammonium salts and nitrates as nitrogen sources for cotton (E. S. R., 66, p. 732) dealt particularly with the influence of the source of nitrogen on fruiting and on certain organic constituents of cotton plant saps.

Ammonium salt solutions produced better vegetative growth and decidedly better fruiting in their respective series in three of four cases than did nitrate

solutions. The growth rate was high in all series, and the reaction of the medium was usually between pH 4 and 6. An increased proportion of divalent bases in the solutions improved vegetative growth with ammonium salts and improved the conversion of nitrate nitrogen.

With conditions favoring carbohydrate formation after absorption, the ammonium ion was converted rapidly into organic nitrogen compounds and no appreciable accumulation of ammonia nitrogen was noted in the ammonia-treated plants. The nitrate nitrogen was converted into organic forms more slowly than ammonia nitrogen, and there were heavy accumulations of nitrates in the nitrated plants with the highest concentrations in the saps of the younger, more active conducting tissues. Saps of ammonia-treated plants had higher concentrations of sugar in early growth stages, but such differences decreased somewhat with age. The nitrated plants tended toward higher water content than those receiving ammonium, especially in the stems and leaves.

While the potential efficiency of ammonium salts as a source of nitrogen for cotton plants was established, the requirements for their utilization seemed to be much more exacting than for nitrates.

Results of irrigation treatments on Acala cotton grown in the Mesilla Valley, New Mexico, A. S. CURRY (*New Mexico Sta. Bul.* 220 (1934), pp. 43, figs. 13).—The effects of seven irrigation schemes, involving the furrow and the border flooding methods, on the yield and quality of Acala cotton grown on Gila clay adobe, were studied during the period 1925-33. The agricultural and climatic characteristics of the region are described briefly.

For good stands on this soil, planting evidently should precede irrigation. An interval of from 5 to 6 weeks between the first two irrigations seemed to result in good growth conditions. The wide adaptation of cotton as to water was indicated by the similar yields from 4 or 5 applications and the slightly higher returns from twice as many irrigations. The length of lint was determined largely by moisture conditions early in summer and apparently was not affected by later water stress conditions. While lint percentage was reduced by water stress in September and later, it was not affected by moisture conditions during other parts of the growing season. Yields were not altered materially by additional irrigation after enough water had been applied to maintain a fairly vigorous growing condition. Growth apparently was not impaired even when the leaves were allowed to wilt slightly for a few days before irrigation. Indications were that withholding water late in the summer would hasten maturity, and vice versa, continuing irrigation until late in September could delay maturity with an increase in immature bolls. Practically the same results were obtained from the furrow and flooding methods, although the latter resulted in slightly earlier maturity.

A new method of self-pollinating cotton, W. W. BALLARD (*U. S. Dept. Agr. Circ.* 318 (1934), pp. 4, figs. 2).—The paper-cone method of self-pollinating upland cotton, described and illustrated, is reported to be as effective as the paper-bag method and permits treatment of more than twice as many flowers in an equal period. Fastening the tip of the corolla with a rubber band or wire clip, while rapid, is not considered reliable enough for technical purposes.

Flax-fiber production, B. B. ROBINSON (*U. S. Dept. Agr., Farmers' Bul.* 1728 (1934), pp. II+26, figs. 14).—The climatic, soil, fertility, and seed requirements of fiber flax are indicated and cultural and harvesting operations and the preparation of the fiber are described, with comments on history, markets, and manufactured products. The information supersedes that given in Farmers' Bulletin 669 (E. S. R., 33, p. 232).

Quantity and quality of oil produced from different types and varieties of flax, F. J. BIRCHARD (*Canada Dept. Trade and Com., Grain Res. Lab. Ann. Rpt. 5 (1931), pp. 10-16*).—Examination of oil extracted from normal, frosted, scabby, and heated flaxseed and variety samples indicated that frost tends to reduce the quantity and deepen the color of oil, usually without effect on drying quality; that scab probably does not affect yield or drying quality, although badly scabbed samples yield deep amber oil; and that heat damage does not reduce oil content unless severe, in which case drying quality and color are also impaired slightly. Varieties tested seemed normal in all respects, yellow flax tending to give a somewhat higher yield of oil.

Potato experiments, J. BUSHNELL (*Ohio Sta. Spec. Circ. 45 (1934), pp. 41-45, figs. 4*).—Brief reports are made on potato experiments dealing with new varieties, aerating soil with sand and perforated tile, corn and rye as green manures, fertilizer placements, response to manure, relation of planting date to sprout production, size of set, and rate of planting.

The potatoes of South America and their breeding possibilities [trans. title], S. M. BUKASOV (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant-Breeding), 1933, Sup. 58, pp. 192, pls. 2, figs. 55; Eng. abs., pp. 153-192*).—The botanical, cytological, and agricultural characteristics of species of potatoes collected by Soviet agricultural explorers in the Andes, along the West Coast of South America, and in Mexico and Guatemala, are reported in detail, with accounts of their behavior in interspecific crosses, frost and disease resistance, starch contents, and culinary values. Many new wild species were found. In addition to *Solanum tuberosum* (48 chromosomes), there were 13 new cultivated species including the widely grown *S. andigenum* (48), and the primitive rosette-forming, hardy *S. juzepczukii* (36), *S. curtilobum* (60), *S. ajanhuiri* (24), and the tender *S. stenotomum* (24 and 36). The primitive species forming no rosette comprised the yellow-fleshed *S. goniocalyx* (24 and 36); *S. rybinii* (24) and *S. boyacense* (24), both having short rest periods; the early *S. phureja* (24) and *S. chaucha* (36); and the triploids *S. tenuifilamentum* (36), *S. mamilliferum* (36), and *S. choclo* (36).

[Potato seed maintenance and spraying experiments] (*Maryland Sta. Bul. 361 (1934), pp. 345-364, figs. 3*).—The investigations are reported on in two parts.

I. *Potato seed maintenance studies in Maryland*, R. A. Jehle and J. W. Heuberger (pp. 345-356).—Tuber-index and tuber-unit planting reduced rugose mosaic from 25 to 1 percent in 5 yr. in McCormick potatoes, and one tuber-index planting practically eliminated virus diseases in Russet Rural and Dooley potatoes. The vitality of the Irish Cobbler, Smooth Rural, Russet Rural, Green Mountain, and Katahdin seedstock was not reduced by growing 1 yr. as a late crop on the Eastern Shore of Maryland. The studies demonstrated that practically disease-free seed stocks of McCormick can be developed and maintained, and suggested that prolific seed stock practically free from diseases and mixtures can be developed and maintained by tuber-index planting in the spring, followed by tuber-unit planting in the fall on the Eastern Shore or tuber-unit planting at high elevations.

II. *Spraying early and late potatoes on the Eastern Shore of Maryland*, R. A. Jehle, E. N. Cory, and R. T. Grant (pp. 357-364).—During 3 years with 6 crops of Irish Cobbler potatoes, spraying with Bordeaux mixture and calcium arsenate resulted in an average acre increase of 49 bu. of primes (U. S. Nos. 1 and 2) and a total average increase of 37 bu., compared with the usual practice of spraying or dusting with an arsenical only, and injury was less from early blight, flea beetle, and leaf hopper. In dusting tests, average increases amounted

to 42 bu. of primes and 13 bu. total in the early crop of Irish Cobblers, and 55 and 13 bu., respectively, in the late crop. Compared with Bordeaux-calcium arsenate spray, the yield increase due to monohydrated copper-lime dust was smaller in the early crop and greater in the late crop. Addition of nicotine sulfate to the spray or dust did not increase yields when few aphids were present. Practical applications of the results are outlined, with remarks on early blight, flea beetle, leaf hopper, and hopper burn.

Shortening the rest period of the potato, W. STUART and E. H. MILSTEAD (*U. S. Dept. Agr., Tech. Bul. 415 (1934), pp. 32, figs. 9*).—In chemical treatments of potato sets to shorten the rest period (essentially those recommended by Denny (E. S. R., 59, p. 828), who collaborated in the fall of 1927), made during the fall and winter of 1928–29, the Prolific showed the quickest response among 27 varieties treated and was followed closely by four others. Sets treated with a 6-percent solution of ethylene chlorhydrin and in 1- and 2-percent solutions of sodium thiocyanate and held afterward in tight containers from 6 to 48 hr. gave the most pronounced results. Sets dipped in a 3-percent sodium-thiocyanate solution and held in closed containers for from 6 to 24 hr. were delayed in germination and the plants produced showed considerable foliage injury. Sets of Dakota Red treated on November 12 did not respond in 28 days, while sets treated December 20 gave 100 percent germination in 27 days, the difference being attributed to a lessened depth of the rest period.

In the 1929–30 experiment where the relative merits of the ethylene-chlorhydrin and sodium-thiocyanate treatments were compared with 23 varieties, considerable variation in response was noted. Prolific showed the quickest response from the ethylene-chlorhydrin treatment, and Early Rose, Noroton Beauty, Prolific, Burbank, and Keeper appeared to have the shortest rest period. Based on relative germination of treated and untreated sets, the most successful results were obtained from White Ohio, Beauty of Hebron, Queen-of-the-Valley, Early Manistee, and White-Eyed Peachblow.

The treatments of whole tubers in 1931 with ethylene-chlorhydrin gas for 24 and 48 hr. demonstrated its efficacy in shortening the rest period. Certain varieties appeared to be more easily stimulated into growth than others. Prolific and Katahdin apparently are sensitive to chemical treatments and also seem to have a short rest period.

The results on the whole indicated a prompter germination response from ethylene-chlorhydrin treatments than from sodium thiocyanate, although the latter usually soon overtook and often surpassed the former. See also an earlier note by Wright and Peacock on the rest period and dormancy (E. S. R., 71, p. 768).

Growing fall Irish potatoes, W. D. KIMBROUGH (*Louisiana Sta. Circ. 11 (1934), pp. 3*).—Cultural methods, field practices, seed treatments, and varieties are suggested for the autumn crop of potatoes.

The storage of new potatoes, A. M. SMITH (*Scot. Jour. Agr., 17 (1934), No. 2, pp. 202–207*).—The preservation of the characteristics of new potatoes, according to the experiments reported, requires a suitable variety, e. g., King Edward, lifting tubers when immature by harvesting about 2 weeks before the usual time rather than by late planting, and proper storage. Best results were obtained by packing tubers in fruit barrels about 2 to 2.5 cu. ft. in capacity and storage in a cellar around 40° F. Each barrel held about 40 to 50 lb. of potatoes in 6 or 7 layers, interspersed with similar weights of a packing mixture of about equal volumes of peat and sand with a moisture content averaging between 10 and 12 percent. Presence of 1 percent of calcium

carbonate seemed to lessen the tendency to sprout, but the effect was not general. Additions of apples did not inhibit sprouting.

Botanical classification of cultivated rice [trans. title], G. G. GUSTCHIN (*Riz et Rizicult.*, 8 (1934), No. 1, pp. 1-46, 52, pls. 2).—The classification embraces three main groups: Rice with kernels from 5 to 7 mm long, with (a) long, thin kernels and (b) broad, thick kernels, and rice with kernels 4 mm long. Earlier classifications are reviewed, and the merits of taxonomic and botanical characters for the purpose are appraised.

Anthesis, pollination, and fertilization in sorghum, J. C. STEPHENS and J. R. QUINBY (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 2, pp. 123-136, figs. 5).—In cooperative observations made at Chillicothe by the Texas Experiment Station and the U. S. Department of Agriculture on hermaphrodite flowers that opened each hour during the full course of blooming, the average peak of flowering occurred in Blackhull kafir between 11 p. m. and 1 a. m., in Spur feterita and Chinese Amber sorgho between 1 and 2 a. m., and in Standard Yellow milo between 5 and 6 a. m. Blooming began in the apex of the panicle, progressed downward, and required from 6 to 9 days for completion. Staminate flowers began to open from 2 to 4 days later than hermaphrodite flowers. From the time the glumes first began to spread, individual spikelets of Spur feterita averaged 7 min. to become fully open, 20 min. to begin closing, and 2 hr. 7 min. to become completely closed. When a plant was kept under a light at night and in a dark room during the day, the normal rhythm or periodicity of blooming was reversed in approximately 36 hr. While changes in temperature modified the rhythm, relative humidity did not seem to influence the time of blooming. Agitation of the panicles on very quiet nights accelerated blooming.

Approximately 5,000 pollen grains were counted in each of two anthers of Spur feterita examined. Pollen deteriorated rapidly, and no seed was set when pollen was used 5 hr. or more after collecting from dehiscent anthers. Stigmas were receptive at least 48 hr. before blooming and from 8 to 16 days after. Cytological examination of ovules collected at 2-hour intervals after pollination showed that fertilization takes place between 6 and 12 hr. after pollination.

Cayuga soybean: A home-grown, high-oil high-protein concentrate, R. G. WIGGANS ([*New York*] *Cornell Sta. Bul.* 601 (1934), pp. 32, figs. 5).—Cayuga soybeans, introduced by the U. S. Department of Agriculture from Manchuria and carried forward by the station since 1927, appear worthy of consideration by New York dairymen because of their adaptation, regular productivity, high protein content and feeding value, and possibilities as a cash crop and to replace expensive commercial feed.

At the station this soybean has averaged 25 bu. per acre in cultivated rows and 38 bu. in drills. While properly handled solid drilling may give greater yields, cultivated rows wide enough for satisfactory cultivation appeared best for New York conditions at present. The plant is very early, maturing near Ithaca on or before September 10 when planted by June 1, is upright and determinate in growth, and its pods do not shatter on maturity. Its chemical composition was not found to differ much from the averages of all soybeans. Earliness and other features made Cayuga more desirable than several varieties and strains outyielding it in variety trials. In cultivated rows Cayuga yielded slightly less than drilled Cornelian oats or Alpha barley, but when drilled it outyielded them by wide margins and excelled in production of total digestible nutrients. Production practices, especially for seed, are outlined and experiences of growers are reviewed. Summaries of feeding

trials with dairy cattle comparing soybeans with other high-protein concentrates are included.

Bolting in sugar beets, K. ESAU (*Facts About Sugar*, 29 (1934), No. 5, pp. 155-158, fig. 1).—Bolting, i. e., seed stalk development in the first year of growth, was observed in sugar beets sown in November and December in central California. The influence of climatic and soil conditions and variety were evident. In comparison of material from the Sacramento and Salinas Valleys, early bolters tended to produce slightly smaller roots than normal beets which in turn were smaller than late bolters. Early bolters showed a higher percentage of marc than late bolters and normal beets. The different types did not seem to differ significantly in sugar percentage and purity of juice. Selection and breeding might bring about reduction in percentage of bolting.

The composition of bolters and woody beets [trans. title], J. PÁZLER, A. RŮŽICKÁ, and K. PÁTEK (*Ztschr. Zuckerindus. Českoslovak. Repub.*, 58 (1934), No. 28, pp. 221-226).—The tendency of sugar beets to bolt and to produce fibrous roots is said to be increased by unfavorable conditions during and after germination, such as low temperature, especially below freezing, and by drought during development of the small beets. Comparative analyses showed mature bolters to have a higher sugar percentage and purity, more ash, invert sugar, and pulp, and less nitrogen than normal beets, whereas developing bolters had a lower sugar content and purity and a higher content of ash. The woody beets contained more sugar, invert sugar, ash, and pulp than normal beets. Undeveloped bolters are considered much less favorable than mature bolters for sugar production. The higher sugar content of woody beets may be offset by difficulties in the manufacture of sugar.

Value of natural weed fallow in the cropping system for tobacco, D. E. BROWN and J. E. McMURTREY, JR. (*Maryland Sta. Bul.* 363 (1934), pp. 401-410, figs. 2).—Field experiments (E. S. R., 55, p. 233) in cooperation with the U. S. Department of Agriculture, continued for 21 yr., demonstrated that satisfactory yields of tobacco could be maintained by using legumes and fertilizer. Hairy vetch as a cover crop with continuous tobacco and red clover in a 3-year rotation including wheat gave the best results. Legumes without fertilizer were of little value in maintaining yield. A general tendency of legumes to cause rapid decline in quality of leaf was compensated in part by increasing the potash in the fertilizer. Average leaf quality obtained with red clover in the rotation, although not especially good, decidedly surpassed that where other legumes were used.

When tobacco was grown after weed fallow very satisfactory yields, quality, and acre values were obtained. Weed fallow promotes a quick start and a rapid uniform growth of tobacco plants. One year of weeds between successive tobacco crops gave excellent results over 10 yr., although more recent data indicated that 2 yr. of weeds between tobacco crops would prove better over a longer period. When bare fallow replaced weeds, the good results obtained for only 2 or 3 yr. were followed by rapid decline in yield and quality. See also an earlier note (E. S. R., 71, p. 473).

Tobacco fertilizer recommendations for 1935, C. B. WILLIAMS ET AL. (*North Carolina Sta. Agron. Inform. Circ.* 87 (1934), pp. [2]+5).—Analyses, rates per acre, and sources of nutrients are recommended for fertilizers for flue-cured, sun-cured, and shipping tobacco, and for plant beds on tobacco soils in Virginia, North Carolina, South Carolina, and Georgia. Suggestions for control of downy mildew and root knot of tobacco are appended.

Studies on the fermentation of tobacco, J. JOHNSON (*Jour. Agr. Res.* [U. S.], 49 (1934), No. 2, pp. 137-160, figs. 10).—The microbial and enzymic

factors possibly concerned with the fermentation or sweating of cigar-leaf tobacco were investigated cooperatively by the Wisconsin Experiment Station and the U. S. Department of Agriculture. The Dewar flask method was used, and modifications of technic permitted operations under aseptic conditions and inoculations with pure cultures of micro-organisms.

Average temperature increases with 150 g of tobacco in Dewar flasks over a 10-day period ran as high as 5.6° C. The generation of heat (thermogenesis) was in general directly proportional to the percentage of moisture, a minimum of about 30 percent being necessary for measurable activity. The highest thermogenic increases occurred at incubator temperatures of about 20° to 25° C. (68° to 77° F.) with very little if any activity developing below 10° or above 45°. This experimental maximum temperature, considerably below that often allowed in practice by the bulk-fermentation method, suggested the possibility of better results at more moderate temperatures.

Thermogenesis, it was observed, might be almost completely checked by chloroform, mercuric chloride, acetone, toluene, or beta-naphthol. These antiseptics check microbial activity and, although not destroying peroxidase and other enzymes, seem to cause inactivation. Silver nitrate, however, reduces thermogenesis under similar conditions to only about one-half of normal. Heating the tobacco high enough will completely check thermogenesis or any other expression fermentation, provided aseptic conditions be maintained. Thermogenesis was not induced by treating such tobacco aseptically with porcelain-filtered extract from unheated tobacco containing peroxidase and other enzymes.

Although three species of bacteria commonly occurring on tobacco failed to induce thermogenic activity in heated tobacco, several fungi isolated from tobacco, e. g., *Aspergillus niger*, *A. ochraceus*, and *A. terreus*, were very efficient, yielding results thermogenically and otherwise comparable to normal fermentation. Micro-organisms, especially fungi, evidently may take part in the fermentation or in processing of certain types of cigar-leaf tobacco, although they may not necessarily be essential to fermentation.

Classification of wheats by their reactions to carbohic acid [trans. title], L. FRIEDBERG (*Ann. Agron. [Paris], n. ser., 3 (1933), No. 5, pp. 697-736, figs. 4*).—Numerous varieties pertaining to several species of *Triticum* are grouped according to the color reactions of their kernels and spikes to immersion in 1 percent solution of carbohic acid. The author indicates that the method is useful alone or as a supplement to other characters in distinguishing varieties and lines of wheat, and that it may be extended to differentiate varieties of barley, rye, and possibly oats. He also outlines his technic and discusses other classifications, correlation of carbohic acid coloration with other characters, its genetic behavior, localization of the coloration in the kernel, and the mechanism of the action of the acid.

The tillering of wheat: Relation between the depth of the tillering node and cold resistance [trans. title], R. FRIEDBERG (*Ann. Agron. [Paris], n. ser., 2 (1932), No. 2, pp. 215-228, figs. 4*).—Experiments wherein seed of numerous wheat varieties were planted at varying depths (1-9 cm) demonstrated that for a given variety the depth of tillering node increased with depth of planting, and at equal depths the depth of this node differed with variety. The situation of this node is affected by environmental conditions, particularly by illumination in early development stages. Varieties resistant to cold appeared to tiller more deeply than sensitive wheats. Capacity to develop a tiller from the coleoptile is a varietal characteristic, permitting wheat of which the growing tip is killed by cold, to renew growth. This explains why such wheats

as Goldendrop, although sensitive to cold, survive better than equally sensitive wheats which seldom develop coleoptile tillers.

Dominion Grain Research Laboratory, Winnipeg, Man., [third to sixth annual reports], F. J. BIRCHARD (*Canada Dept. Trade and Com., Grain Res. Lab. Ann. Rpts.*, 3 (1929), pp. 10; 4 (1930), pp. 36; 5 (1931), pp. 43; 6 (1932), pp. 35).—The continuation of earlier activities (E. S. R., 62, p. 429) is reviewed in the several reports, which include summaries of surveys of the protein content of contract grades of hard red spring wheat grown in western Canada in 1930, 1931, and 1932, and the milling-baking characteristics of the crops, investigations on the drying of wheat, and moisture tests. Special accounts on the comparative values of Canadian and foreign wheats, the effect of different percentages of soft starch wheat on the baking quality of hard red spring wheat, and the oil content of damaged flax also are included in the fourth report; on the quantity and quality of oil produced from different types and varieties of flax, the protein content of Garnet wheat, and the quality of spring-threshed wheat in the fifth report; on the effect upon the milling quality of heavy contamination of a wheat from southern Alberta with smut from a grain-field weed known as "ladies' finger" [presumably *Polygonum* sp.]; and a study of the suitability of electrical moisture testers for the commercial determination of moisture in grain in the sixth report.

On the viable seeds present in the soil beneath pastures, H. G. CHIP-PINDALE and W. E. J. MILTON (*Jour. Ecol.*, 22 (1934), No. 2, pp. 508-531).—The viable weed-seed contents of the soils underlying 14 pastures in Wales were determined by examination of seedlings developing from profile samples taken to a depth of 12 in. The extreme variation showed by different species in number of viable seeds in the soil was correlated with complete absence of association between surface vegetation and the seed flora of the soil beneath. The representation of grasses was very low considering that they were usually dominant in the vegetation and had opportunity to develop seeds. Evidently most species of grasses, possibly *Trifolium repens*, and some other dicotyledons perpetuate themselves in pastures chiefly by vegetative means. The number of seeds of arable plants generally tended to diminish with increasing age of the pasture, although in pastures formerly cultivated seeds of species characteristic of arable land occurred even after 68 yr. The species differed somewhat in occurrence of their seeds at considerable depths. It appeared that germination of the buried seeds is confined largely to spring and summer months, and that delayed germination occurs in seeds of many species of grassland plants.

Weight of 1,000 seeds of some agricultural seeds, F. S. HOLMES (*Maryland Sta. Bul.* 362 (1934), pp. 378, 379).—Samples obtained in seed inspection work averaged for alfalfa 1.94 g per 1,000 seed, alsike clover 0.668, crimson clover 2.87, red clover 1.58, white clover 0.647, Korean lespedeza 2, sweetclover 1.74, timothy 0.36, Kentucky bluegrass 0.224, orchard grass 0.816, redtop 0.083, and winter rape 4.26 g.

Common grass weeds of Nebraska, F. D. KEIM and A. L. FROLIK (*Nebraska Sta. Bul.* 288 (1934), pp. 40, figs. 19).—Grass weeds described with distribution areas and control methods include crabgrass, barnyard grass, tickle grass, the bristly, yellow, and green foxtails, sandbur, wire grass, wild oats, yard grass, stinkgrass, purple lovegrass, slender fescue grass, downy brome, cheat, quackgrass, little wild barley, and wild barley.

Bindweeds and their control, T. A. KIESSELBACH, N. F. PETERSEN, and W. W. BURR (*Nebraska Sta. Bul.* 287 (1934), pp. 47, figs. 17).—Observations and experiments during 15 yr. on the identification, growth habits, means of dis-

semination, and eradication of field bindweed (*Convolvulus arvensis*) are summarized, with remarks on the effect of chlorate on various plants and succeeding crops and on the eradication of hedge bindweed (*C. sepium*).

Clean fallow and chemical treatment appeared to be the only practical methods available for extensive use in eradication, and both involve the loss of land for at least a year or two. Clean fallow, based on the principle of root starvation, requires thorough cultivation with an implement designed to cut off all vines about 4 in. or more below the soil surface, as with duckfoot cultivators, or corn cultivators with wide duckfoot or sweep shovels, and skipped plants hoed off. Such fallow begun in spring requires about 15 cultivations in the first year and 6 or more in the second, whereas starting in midsummer just after small grain harvest and fallowing throughout the next year, if successful in eradication, would involve loss of but one crop.

Sodium chlorate, found the most effective and cheapest chemical for bindweed control, could best be applied under Nebraska climatic conditions in May and June before hot weather, and in September and October after hot weather. Sprays appeared slightly more effective than dry applications. It can be drilled in with a grain drill or applied as a spray with 1 to 3 lb. per gallon of water. More chlorate is required on fertile soil, and it acts quicker in loose sandy soils than in heavy soils. For average conditions 2.5 to 3 lb. per square rod, or 400-480 lb. per acre, seemed suitable for a first application. A second treatment, varying from 5 to 200 lb. per acre, may be required a month or two after the first, or in the spring following late summer or fall treatment. With both fallow and chlorate subsequent cropping practice should destroy seedlings growing from seed carried over in the soil.

Other proposed methods tested, including smothering with impervious material and treatment with sodium chloride, proved limited in their application, and certain other chemicals, pasturing, and planting sorgo, Sudan grass, and sweetclover as smother crops failed as eradication measures, although smother crops may check bindweed growth somewhat.

Control of weeds with chemicals, F. V. GRAU (*Maryland Sta. Bul. 362* (1934), pp. 374-378).—Chemical sprays and other treatments are recommended for the control of Canada thistle, perennial sow thistle, blue flowering lettuce, ironweed, chicory, field pepper grass, bindweed, Johnson grass, creeping vine types, Bermuda grass, quackgrass, wild garlic, lawn weeds (E. S. R., 71, p. 474), dandelions, and miscellaneous creeping vine and deep-rooted types, annuals, and perennials.

HORTICULTURE

[Horticultural crops in the Imperial Valley], S. W. COSBY and L. G. GOAR (*California Sta. Circ. 334* (1934), pp. 78-108, figs. 4).—Information is presented on the soil and cultural requirements of various truck and fruit crops, including artichokes, asparagus, cabbage, cantaloups, lettuce, onions, almonds, dates, grapefruit, pecans, and pomegranates, and various ornamental and windbreak species. Planting calendars are included.

[Horticulture at the Idaho Station] (*Idaho Sta. Bul. 205* (1934), pp. 11, 50-52, figs. 2).—Briefly there are discussed the results of experiments in spray residue removal from fruits, apple breeding, relation of the maturity of apples to keeping quality, fertilizing of apple trees, cracking of sweet cherries, pruning of grapes, spacing of tomato plants, and the testing of sweet corn varieties.

[Horticulture at the Moses Fell Annex Farm] (*Indiana Sta. Circ. 203* (1934), pp. 12-15, figs. 3).—Brief comments are again (E. S. R., 69, p. 798) presented on the results of studies of the comparative cost of stationary and

portable spraying outfits, the cost and efficiency of apple washing, codling moth control, orchard soil management, and farm garden management.

[Horticulture at the Kentucky Station] (*Kentucky Sta. Rpt. 1933, pt. 1, pp. 27, 35-39, 40, 41, 66*).—Information is presented on the use of cornstalks as a heating medium for plant beds; the effect of organic matter, sodium carbonate, and ground limestone on tomato yields; the planting of tomatoes in groups of four; the effect of the spacing of tomato plants in beds on their later development and yield; variety testing of tomatoes, sweet corn, and potatoes; the response of cabbage to different nitrogen carriers and to plant bed care; effects of a combined application of copper, boron, iodine, bromine, and arsenic on tomato, cabbage, and other vegetables; variety testing of strawberries; control of diseases in raspberries; effect of Bordeaux mixture and lime-sulfur on raspberry foliage; variety testing of apples; and cover crops for young apple orchards.

In addition, experiments at the Western Kentucky Substation on the culture of apples and the spraying of raspberries are discussed.

[Horticulture at the New Jersey Stations] (*New Jersey Stas. Bien. Rpt. 1932-33, pp. 24, 25, 26, 27, 28, 29, 41-50, 51-56*).—Condensed reports are presented on the results of the following studies: Cranberry fertilizing, depth of planting cranberry cuttings, and blueberry cultivation and fertilizing, all by C. S. Beckwith and C. A. Doehlert; peach breeding, observations on hardiness in various peaches, value of peach varieties for freezing preservation, growth habits of the apple, and soil reactions in New Jersey orchards, all by M. A. Blake; sulfur metabolism in the tomato, the effect of humidity on the metabolism of tomatoes, effect of temperature on ammonia and nitrate nutrition of the apple, and the effect of temperature on the metabolism of peaches, all by G. T. Nightingale; tomato breeding, factors affecting the quality of tomato juice, asparagus breeding, anatomy of the asparagus plant, celery chlorosis on alkaline soils, correlation of available soil nutrients with nutrients in the plant and its growth, rhubarb varieties, and the operation of electrically heated hotbeds, all by L. G. Schermerhorn and W. R. Robbins; culture and nutrition of greenhouse plants, such as carnations, sweet peas, and roses, and the culture of outdoor ornamentals, both by C. H. Connors; strawberry breeding, control of noninfectious chlorosis of the strawberry, nutrition of the strawberry, soil management of the raspberry, and variety testing of small fruits, all by J. H. Clark.

[Horticulture at the Ohio Station], F. S. HOWLETT, C. W. ELLENWOOD, J. H. GOURLEY, F. H. BALLOU, I. P. LEWIS, L. HAVIS, J. S. SHOEMAKER, I. C. HOFFMAN, D. COMIN, J. BUSHNELL, H. D. BROWN, O. N. RILEY, A. LAURIE, G. R. MANN, G. H. POESCH, and [L. C.] CHADWICK (*Ohio Sta. Spec. Circ. 45 (1934), pp. 1-41, 45-51, figs. 8*).—Designed to present some of the more important practical results of horticultural research at the station, this publication discusses experiments in pollination and fruit setting in the apple and pear; the flowering and fruiting habit of the Delicious apple; the breeding of apples; spraying with lime-sulfur and other sulfur compounds; use of dilute Bordeaux mixture in controlling blotch, Brooks spot, and bitter rot; comparative value of high magnesium and high calcium limes for spraying; cause and control of russetting; pruning of apples; sod culture of pears; thinning of apple fruits; prevention of alternate bearing; removal of filler trees; frost penetration in orchard soils; variety testing of apples, pears, and various small fruits; peach pruning; thinning of peach fruits; hardiness of peach buds; cherry and plum pollination; effect of manure on grapes; training of grapes; chemical composition of grapes; and culture of red and black raspberries and strawberries.

The studies with vegetables included causes of flower abscission in the tomato; breeding of greenhouse vegetables; varietal trials; effects of varying soil moisture on the growth of greenhouse tomatoes; fertilizers for greenhouse vegetables; nutritional deficiencies in greenhouse tomatoes and cucumbers; and general investigations at the Muck Crops Experiment Farm in Hardin County.

Work in floriculture embraced fertilizer trials; water relationships; photoperiodic effects; culture in sand; nutritional deficiency effects; soil reaction studies; use of cloth houses; propagation; mulching of ilex, abelia, and pyracantha; and the keeping quality of cut flowers.

Tolerance of liquid-air temperatures by seeds of higher plants for sixty days. C. B. LIPMAN and G. N. LEWIS (*Plant Physiol.*, 9 (1934), No. 2, pp. 392-394).—At the University of California Hubbard squash, Santa Clara tomato, White Spine cucumber, Golden Bantam corn, and American Wonder pea seeds, previously dried over calcium chloride, withstood without loss of viability or injury to the resulting plants an exposure to a temperature of liquid air for 60 days.

Effects of humidity on metabolism in tomato and apple. G. T. NIGHTINGALE and J. W. MITCHELL (*Plant Physiol.*, 9 (1934), No. 2, pp. 217-236, fig. 1).—In this cooperative study conducted by the New Jersey Experiment Stations and the University of Chicago, Bonny Best tomato plants grown at 70° F. in chambers where relative humidity was maintained at 35 and 95 percent, respectively, were found to differ decidedly in appearance and in composition. The 35 percent plants were lighter green, grew slowly, and had relatively thick stems and leaves. Carbohydrates and total organic nitrogen were relatively high in this lot, with much of the nitrogen in the form of complex insoluble proteins. The 95 percent plants were dark green and grew rapidly. Carbohydrates were relatively low, and much of the organic nitrogen was water soluble.

Observations on small Rome Beauty apple trees growing in chambers of 40 and 95 percent relative humidity showed much the same growth differences as were exhibited by the tomatoes. In the 40 percent lot there was an accumulation of carbohydrates and an apparent condensation of the simpler forms of organic nitrogen to complex proteins. The leaves were lighter green, but the current stem growth exhibited more red color than in the 95 percent lot. Terminal buds formed at the end of 18 days in the 40 percent chamber, with no evidence of comparable maturity in the 95 percent lot.

Some effects of cover crops and their management on the fertility of Norfolk sandy loam. E. D. FOWLER and R. D. LEWIS (*Southeast. Pecan Growers Assoc. Proc.*, 28 (1934), pp. 37-46).—Of various cover-crop treatments tested as a means of increasing the organic-matter content of Norfolk sandy loam soils used in pecan growing, all were effective, with a maximum increase of organic matter on the plat seeded each fall to Austrian peas or monantha vetch and followed by runner velvetbeans in summer. Total nitrogen increased most rapidly on the plat in which Austrian peas or monantha vetch were grown in the winter and allowed to lie undisturbed during the summer. Nitrate nitrogen and water reached a maximum during the third season on the plat where Austrian peas and monantha vetch were grown in winter, incorporated in the soil in the spring, and tilled through the summer. The poorest results in organic matter, total nitrogen, and nitrate nitrogen were secured with Bermuda grass.

Some factors which influence the fruiting habit of Henderson's bush lima bean (*Phaseolus lunatus*). L. HAVIS (*Ohio Sta. Bul.* 535 (1934), pp. 13, figs. 3).—Seeking to determine the causes of the irregular maturity of beans, a

condition apparently associated with the peculiar twining habit of growth, selections were made in the field in an attempt to isolate nontwining plants, but without success. A detailed study was then made of the growth and fruiting habits of the bean plant. The spacing of the plants was found to have a considerable effect on growth habit but not on the twining tendency. Plants grown from seed sown May 14 and June 3 exhibited no twining, whereas plants from sowings of June 29 included many with twining tendencies. Apparently the favorable growing conditions of summer promoted a rapid elongation of the sixth and seventh internodes, which resulted in twining. The fruits on the terminal racemes matured most rapidly, even though flowering occurred at the same time on the other racemes. Bean plants developed most rapidly in soils of pH 7 to 8, but all plants of moderate or better growth twined irrespective of the soil reaction. Plants grown under shade developed less woody and thinner roots, more succulent stems, and a higher top-root ratio. Under shade twining followed the rapid development of the sixth and seventh internodes. Twining was, therefore, simply a manifestation of a condition favoring the rapid development of the upper nodes, terminal racemes, and pods and beans therein.

Physiological and chemical changes in carrots during growth and storage. H. PLATENIUS ([*New York*] *Cornell Sta. Mem.* 161 (1934), pp. 18, figs. 14).—Studies of two lots of Chantenay carrots, the first grown from seed sown May 1 and the second from seed sown at semimonthly intervals from May 1 to August 16, led to the conclusion that young carrots are not definitely higher in quality as measured by sweetness and color intensity than mature carrots. Of the several carbohydrates concerned, starch was found in very small amounts in the roots at all stages of growth. Sucrose and glucose, the only sugars found, remained rather constant in total amount, but there was an increase in sucrose and a decrease in glucose as maturity advanced. At first there was a rise in total sugars in stored carrots due to hydrolysis of polysaccharides to simple sugars.

In storage carrots kept for 6 mo. at 32° and 40° F., and losses of 10 and 13 percent in weight at the two temperatures were largely water losses. With a relative humidity of 93 to 98 percent respiration and transpiration apparently proceeded at the same rate. Comparison of stored carrots with fresh southern-grown bunched carrots bought in the open market indicated that the stored product is higher in quality. Bunched carrots stored for several weeks showed at first a movement of water toward the leaves, followed by a return when the tops began to die. Sweetness was highest immediately after harvest, declining very slowly during storage at low temperatures. Tenderness, as measured by content of crude fiber, changed but little in cold storage at the lower temperatures. Protein hydrolysis, occurring slowly during storage, is not considered a significant factor in carrot deterioration.

Chemical changes in carrots during growth. H. PLATENIUS (*Plant Physiol.*, 9 (1934), No. 3, pp. 671-680, figs. 5).—The material herein presented was largely covered in the preceding paper.

A study of some factors affecting the production and marketing of Louisiana carrots, I-III. H. S. MOLES, F. D. COCHRAN, and J. C. MILLER (*Louisiana Sta. Bul.* 251 (1934), pp. 14, figs. 3).—This paper is presented in three parts.

I. Some factors affecting carrot prices of bunched carrots.—The results are presented of a comparative study of methods of producing, packaging, and marketing carrots in Louisiana, California, Texas, and New York. An analysis

of the results indicated that Louisiana carrots were not graded or packed carefully enough and that the color was too light during the winter months.

II. *Some factors influencing the color of carrots.*—The causes of poor color of Louisiana carrots are analyzed. Plantings of Danvers carrots made in October at Baton Rouge, Cut Off, Lockport, and Labadieville, the soils of which had respective reactions of pH 5.5, 5, 7.1, and 6.2, indicated that soil reaction is not a factor in coloration but may influence yields. Excessive soil moisture, with consequent reduced aeration, is believed the primary cause of poor color. In any given variety there were less poorly colored carrots in the spring than in the winter crop, and there was noted a variation in color of individuals in any one variety, suggesting the possibility of selective breeding.

III. *Production program for Louisiana carrots.*—Cultural information is presented, with notes on insect and disease control.

Vegetative and reproductive responses associated with fruit development in the cucumber, J. P. McCOLLUM ([New York] Cornell Sta. Mem. 163 (1934), pp. 27, figs. 13).—Utilizing as plant material a selected selfed strain of White Spine practically free from laterals except when grown in midsummer, no evidence was found in this study, begun at Cornell University and completed at the University of Illinois, that the fertilization of the cucumber flower results in increased metabolic activity, as was reported by Murneek for the tomato (E. S. R., 56, p. 440). Under the restricted growing conditions employed, the growth of other fruits was invariably inhibited immediately after a fertilized fruit started its development. Plant growth, on the other hand, was not inhibited until the developing fruit was from 4 to 5 in. long. In the case of parthenocarpic fruits the characteristic inhibitive effect was not observed, although growth was slightly decreased. The inhibitive effects of the fertilized fruits became less marked as they began to yellow and the seed coats began to harden.

Chemical analyses of the plants and of the developing fruits indicated that plants with fruits removed without fertilization were higher than fruiting plants in reducing sugars, polysaccharides, and soluble and insoluble nitrogen on a fresh weight basis. No nitrates were observed in fertilized developing fruits, but the upper region of the inhibited plants showed more nitrates than did the corresponding region of vegetative plants, suggesting that some other factor than nitrogen must be the primary cause of limited growth. Since carbohydrates were high in the nonfruiting plants, fruit development could not be associated with their accumulation, leading the author to suggest that the most logical explanation of the inhibitive mechanism lies in the assumption that developing, fertilized ovaries of the cucumber produce a growth-regulating substance of a hormonal nature.

Carbohydrate-nitrogen and base element relationships of peas grown in water culture under various light exposures, O. E. STREET (*Plant Physiology*, 9 (1934), No. 2, pp. 301-322, figs. 3).—In experiments with Nott Excelsior peas grown in differential water cultures and exposed to 10, 13, and 17 hr. of light, it was observed that the duration of the light had a marked influence on the interrelations of K, Ca, and Mg. The 10-hr. plants were high in K and low in Ca and Mg, whereas the 17-hr. group was low in K and usually highest in Ca and Mg. The mutually repressive effect of the three bases was evident. Where K was present in large amounts and Mg and Ca low, K was so strongly repressive as to overshadow other factors. $\text{Ca}(\text{NO}_3)_2$ in high concentration stimulated growth as measured by top length, dry weight of tops, and dry weight of the entire plant exclusive of seeds. The highest content of total sugars was found in plants in solutions high in Mg. Starch and hemicellulose

were markedly high in the presence of abundant K. Total carbohydrate was high in all cultures except the high $\text{Ca}(\text{NO}_3)_2$. No consistent differences were found in organic nitrogen content.

Carbon dioxide content of the gas from pea pods, Z. I. KERTESZ (*Plant Physiol.*, 9 (1934), No. 2, pp. 339-350, fig. 1).—Samples of Perfection peas collected at 8 a. m. on different dates from the same field were analyzed at the New York State Experiment Station and found to contain a fairly constant percentage of carbon dioxide, averaging 1.6 percent. During the night the carbon dioxide content doubled in the samples, due apparently to a change in the ratio of respiration to photosynthesis. Freezing increased the carbon dioxide content to 4.5 percent, due apparently to increased respiratory activity and perhaps also to changed permeability. Peas sealed with paraffin were found to have a greatly increased carbon dioxide content, suggesting that there must be a vigorous exchange of gases through normal pods.

Studies of the effects of handling methods on the quality of market peas, F. S. JAMISON ([*New York*] *Cornell Sta. Bul.* 599 (1934), pp. 28, figs. 10).—Observing that fresh peas arriving on New York State markets from the far West were generally of higher grade than home-produced stock, a study was made of New York State peas and of various factors such as grading, precooling, and refrigeration during transit that may be concerned with market quality. It was found upon examination that a large part of the peas marketed by New York growers fall below the minimum requirements of U. S. No. 1 grade because of the inclusion of immature, overmature, and insect- or disease-injured pods. In some cases supposedly graded peas contained as much or more inferior stock than did peas shipped without grading.

Analyses of peas taken from different storage temperatures showed a rapid decrease of sugars at 70° F. accompanied by an increase in the percentage of starch and proteins. At 32° the rate of change in these three materials was comparatively slow. The precooling of peas before placement in refrigerator cars resulted in a prompt lowering of the temperature in the car and a better appearing product when marketed. Precooling of peas by immersion in tanks of cool water decreased the temperature not only at time of loading but during the first day of transit. Icing the refrigerator cars 24 hr. in advance of loading proved helpful in securing a satisfactory temperature in the car.

Production of alcohol and acetaldehyde by tomatoes, F. G. GUSTAFSON (*Plant Physiol.*, 9 (1934), No. 2, pp. 359-367).—At the University of Michigan there was found as much as 0.014 percent of ethyl alcohol in red ripe tomatoes as harvested. After 24, 48, and 72 hr. in nitrogen the percentages of alcohol in comparable fruits were 0.04, 0.065, and 0.071, respectively. Green fruits contained as much alcohol as red ripe fruits, and the percentage of alcohol was larger in the large than in the small fruits. Acetaldehyde was found in all tomatoes sampled.

Studies on cold storage of vegetables, H. PLATENIUS, F. S. JAMISON, and H. C. THOMPSON ([*New York*] *Cornell Sta. Bul.* 602 (1934), pp. 24, figs. 4).—Discussing the physiological and chemical changes taking place in stored vegetables, the authors present the results secured with various vegetables grown in the university or nearby gardens and stored at 30°, 32°, 40°, and 50° F. Data are presented on the duration of the keeping period, the quality after removal from storage, loss in weight, etc., and a table is included showing desirable temperatures, relative humidities, and the maximum keeping period of the various species.

Observations on the storage of various fruits and vegetables, I, II, C. W. WARDLAW, E. R. LEONARD, and R. E. D. BAKER (*Trop. Agr. [Trinidad]*, 11 (1934), Nos. 8, pp. 196-200, figs. 2; 9, pp. 230-235).—Two papers are presented.

I. *Tomatoes, cauliflowers, string beans, egg-plant, cucumbers, and muskmelons*.—Among interesting observations were that tomatoes could be satisfactorily held for 20 days at 45° or 50° F. followed by ripening for 5 days at 70°.

II. *Papaws, pineapples, granadillas, grapefruit, and oranges*.—Papaws if well colored but firm at the time of harvest kept practically unchanged for 20 days at 45°. Pineapples held at 60° retained their flavor better than at 50°, but after 15 days had become overripened. Grapefruit subjected to various prestorage treatments such as washing, waxing, and ethylene vapor failed to show any material differences in keeping at 45° or 50°. The mean losses after 80 days ranged from 7.6 percent for a combined ethylene, washing, and waxing treatment to 11.4 percent for borax, ethylene, and washing. Oranges kept well for 50 days at both 45° and 50°, but King oranges stored fully ripe, though appearing attractive after storage, had lost considerable flavor.

Spray residue investigations, H. C. McLEAN (*New Jersey Stas. Bien. Rpt.* 1932-33, pp. 87-91).—Results are briefly discussed of experiments in determining and removing the arsenical residues from cabbage, tomatoes, and cauliflower and developing a new method of removing lead residues.

Recent developments in the removal of spray residue, R. H. ROBINSON (*Better Fruit*, 29 (1934), No. 1, pp. 8, 9).—In discussing various factors (such as wax deposits, oil sprays, and washing solvents) concerned with spray residues and their removal, the author concludes that to meet the 0.014 grain per pound of fruit tolerance suggested for lead the spray programs must be carefully planned to avoid overspraying and leaving too great residues. Hydrochloric acid and sodium silicate are said to be the only two solvents worthy of general use. Of these hydrochloric acid is much more rapid in action, but limited tests showed that excellent results may be obtained with sodium silicate under proper conditions.

A résumé of spray residue removal: Experiences in the State of Washington, E. L. OVERHOLSER and F. L. OVERLEY (*Better Fruit*, 29 (1934), No. 1, pp. 3, 4, 15).—In this general discussion there are presented the results secured with various washing agents, such as hydrochloric acid, sodium silicate, soda ash, etc., used alone and in various combinations, and also the relation of various spraying materials, such as manganese arsenate, fluorine compounds, and nicotine oil combinations to the spray-removal problem.

Removal of lead and arsenic spray residues from New York apples, W. T. PENTZER ([*New York*] *Cornell Sta. Bul.* 604 (1934), pp. 27, pls. 5, fig. 1).—In cooperation with the New York State Station, extensive trials were run in the 1933-34 season of the efficiency of various treatments for removing harmful residues from apples. Wipers and brushes did not prove capable of reducing residues below the prescribed tolerance when the original residue was 1.5 or more times the tolerance. Fruit sprayed according to the usual schedule was successfully cleaned at the time of harvest with 1 percent hydrochloric acid solution in various types of washers. Fruits sprayed with very heavy lead arsenate applications late in the season were cleaned successfully with brush-type washers, but in some cases it was necessary to raise the acid concentration to 1.5 percent. Exposure for more than 5 min. to the 1.5 percent solution frequently injured McIntosh and other tender varieties. Warming the solution to 75° and 100° F. increased removal, but at 75° some injury was noted on McIntosh with an exposure of 5 min. Warming the solution aided in cleansing fruits sprayed late with mineral oil-lead arsenate.

Various textile wetting agents were employed with success, but in some cases injury to the skin in the calyx basin was caused by acid-wetting agent solutions used at high temperatures. With tender-skinned apples, such as McIntosh, small injuries permitted mold spores to enter. Hence, careful handling and clean acid and rinsing waters are recommended to reduce injury to a minimum. It is suggested also that decayed fruits be removed before the washing process. With washers of 100- and 200-gal. capacities it is advised that tanks be cleaned after each 1,000 and 2,000 bu., respectively.

Vegetative propagation of trees and shrubs by means of summer cuttings [trans. title], N. K. VEKHOV and M. P. IL'IN (ILJIN) (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, 1934, Sup. 61, pp. 284, figs. 57; *Eng. abs.*, pp. 127-131, 264, 265).—With data presented largely in tabular form, Vekhov gives the results of investigations at the Forest-Steppe Experiment Station, U. S. S. R., on the propagation of a large number of woody ornamentals and fruit trees by summer cuttings.

Il'in states that the admixture of sphagnum moss to sand increased the percentage of rooting in *Acer dasycarpum* and *Fraxinus lanceolata*. Cutting under water increased rooting in *F. lanceolata*, *A. dasycarpum*, and *A. platanooides* but not in *Quercus rubra*, *Cotinus coggygia*, and *Betula verrucosa*. Cuttings taken from a 2-year-old *Q. robur* tree rooted more readily than those from a 15-year-old tree. Ringing increased rooting in *Q. robur*, *F. lanceolata*, and *C. coggygia*. Abbreviating the length of day increased rooting in several species.

The structural changes in a woody twig after summer pruning, E. M. WRAY (*Leeds Phil. and Lit. Soc. Proc.*, 2 (1934), No. 12, pp. 560-570, pl. 1, fig. 1).—Microscopic studies at the University of Leeds of slides made from shoots of Edward VII and Blenheim Orange apples cut off in July just above the bud and some distance away showed material differences in growth response. Apparently where a section of the internode was left a portion of its reserves was translocated to the internode just below the adjacent bud. The only signs of cambial activity in the snag end were certain indications of phellogen development around the sclerenchyma strands and just within the protoxylem groups and a temporary renewal of the meristem in some cells of the pith. Below the bud, however, there was observed cambial activity of a special character, giving rise to abnormal xylem. This was apparently associated with the rapid development of leaf primordia in the bud, which shortly expanded into a shoot with normal wood developing outside of the abnormal.

Fertility in fruits.—II, Plums [trans. title] C. F. RUDLOFF (*Züchter*, 6 (1934), No. 6, pp. 121-129).—In this second contribution (E. S. R., 70, p. 626), a summary of results of American and European investigations on the self- and cross-compatibility of plums of the *domestica* group is presented. Self-compatible varieties include Admiral Rigny, Deutsche Hauszwetsche, Early Mirabelle, Large Mirabelle, Queen Victoria, Königsbacher Early Prune, Lucas Early Prune, Bergthold Mirabelle, Metz Mirabelle, Oullin, Late Mirabelle, and Wangenheim Early Prune.

Pear growing in New York (*New York State Sta. Circ.* 146 (1934), pp. 11, fig. 1).—Together with spray schedules for the control of diseases and insects, general information is given on culture, pollination, pruning, propagation, varieties, etc.

Cherry growing in New York (*New York State Sta. Circ.* 145 (1934), pp. 13, fig. 1).—This is a general discussion involving varieties, soils, propagation, pollination, care of the orchard, harvesting and handling the crop, control of insect and plant pests, etc.

New tree fruits: Their origin and value, [I], II, G. H. HOWE (*Amer. Fruit Grower*, 54 (1934), Nos. 6, pp. 5, 21, figs. 2; 7, pp. 7, 9, 10, figs. 2).—Brief commentary notes are presented on a number of promising new apples, pears, peaches, plums, and cherries which have been under trial at the New York State Station.

An economic study of grape farms in eastern United States.—I, Production, G. P. SCOVILLE [(New York] *Cornell Sta. Bul.* 605 (1934), pp. 50, figs. 8).—Conducted in cooperation with the U. S. Department of Agriculture, the Pennsylvania State College, Michigan State College, and the University of Arkansas, this study, the results of which are presented largely in tabular form, yields information as to acre yields and total production of Concord grapes in the principal producing regions, the use of fertilizers as related to yield and income from grapes, tillage practices, spraying and dusting programs, and methods of training and pruning, all in relation to costs and returns. In addition, the total costs and the net returns from producing grapes in the various areas are summarized.

Some preliminary studies on the propagation of cacao (*Theobroma cacao* L.) by stem cuttings and by graftage, D. ANIOAY (*Philippine Agr.*, 22 (1934), No. 10, p. 813).—Observations at the College of Agriculture, Laguna, P. I., on Forastero cacao cuttings treated with different concentrations of potassium permanganate, ranging from 0.5 to 3 percent, failed to show any consistent response or superiority over untreated controls. The reduction of transpiration proved of some benefit, as did also applications of bottom heat.

The Dairree date, a promising Mesopotamian variety for testing in the Southwest, R. W. NIXON (*U. S. Dept. Agr. Circ.* 300 (1934), pp. 12, figs. 5).—Accompanied by a discussion of the introduction and identification of the variety, and comments on its unusual capacity for resisting high humidity, there are presented general and technical descriptions of the palm and fruit.

The morphology and physiology of pecan roots, J. G. and N. C. WOODROOF (*Southeast. Pecan Growers Assoc. Proc.*, 28 (1934), pp. 14-17, fig. 1).—The authors point out that the spread of pecan roots is about twice that of the branches and that roots rarely penetrate more than 4 ft. Feeding roots, short in length and in life, are concentrated near the surface where they are easily killed by drought, freezing, and deep cultivation. However, they are quickly replaced when growing conditions again become favorable.

Why plant cover-crops in Florida pecan orchards? G. H. BLACKMON (*Southeast. Pecan Growers Assoc. Proc.*, 28 (1934), pp. 46-54).—Studies conducted by the Florida Experiment Station in Jefferson County showed significant increases in growth and yield of Frotscher and Stuart pecan trees located on plats on which legumes were grown during the winter. Frotscher responded more readily to soil treatments than did Stuart. The increased yield of all the legume plats over the nonlegumes was about 50 percent where no nitrogen was applied and from 80 to 100 percent where ammonium sulfate was supplied. There was a decided rejuvenation of vigor in the trees in all the legume plats.

Twelve years of intensive iris breeding in California: Methods and records, E. O. ESSIE (*Amer. Iris Soc. Bul.* 52 (1934), pp. 2-30, figs. 20).—In this detailed account of iris-breeding operations, the author, a member of the staff of the California Experiment Station, discusses the technic of pollination and of raising young seedlings, and presents a list of parents used and of promising seedlings obtained. Various treatments, including cutting of seed coats, precooling, and X-ray exposure of seeds failed to give significantly more rapid or larger germinations.

Causes of blind wood in roses, D. S. HUBBELL (*Plant Physiol.*, 9 (1934), No. 2, pp. 261-282, figs. 10).—Studies at the Iowa State College indicated that blindness or the failure of new rose shoots to blossom is not a genetic or a pathologic condition but rather a response to nutritive conditions within the plant. The rose shoot apparently has a determinate type of growth with a fairly definite number of nodes determined prior to or at the time of flower initiation; in fact flowering shoots had an average of two more nodes than did blind shoots.

Chemical determinations showed the flowering shoots to contain much smaller quantities of noncolloidal nitrogen, suggesting that this material may have been used in the more active growth processes of the blossoming shoots. Reducing and total sugars were generally lower and insoluble carbohydrates higher in the blind shoots. Blindness was apparently associated with high percentages of noncolloidal nitrogen and insoluble carbohydrates. In the spring, when the percentage of blind shoots normally decreased, there was an increase in the carbohydrate to nitrogen ratio which apparently brought about a condition favorable to flowering.

Bulbs from seed, D. GRIFFITHS (*U. S. Dept. Agr. Circ. 311* (1934), pp. 32, figs. 16).—Based largely on studies at the U. S. D. A. Bulb Station, Bellingham, Wash., information is presented on the seminal propagation of a large variety of bulbous plants, including the crocus, cyclamen, grape-hyacinth, narcissus, lily, tulip, and other less common species.

FORESTRY

[**Forestry developments in the United States**] (*U. S. Dept. Agr. Yearbook 1934*, pp. 158-160, 205-207, 216-220, 225-231, 301-303, 349-353, 376-378, figs. 18).—Included in this group of articles relating to forestry are the following papers: Chance Tree Hybrids of Fast Growth Inspire Timber-Tree Breeding, by F. V. Coville (pp. 158-160); Farm Woods Afford Poor Forage and Deteriorate Rapidly When Overgrazed, by R. K. Day (pp. 205-207); Fire-Control Roads and Motorway Fire Lines in the Lake States Region, by H. Coleman (pp. 216, 217); Fire Wounds Have Close Relation to Exterior Discoloration of Bark, by R. M. Nelson and I. H. Sims (pp. 218-220); Forest Fires in Florida Are Fought with Water and Motorized Equipment, by H. O. Stabler (pp. 225-227); Forests Helped by Thinnings Made under "Free Use" Provision, by T. Kreuger (pp. 227-229); Forest Management in the Northwest Making Progress, by F. Ames (pp. 229-231); Pruning Young Forest Trees Provides Work and Gives Profitable Crops, by B. H. Paul (pp. 301-303); Thinning Plantations in Nebraska Forest Provides Fuel and Improves Stand, by A. L. Nelson (pp. 349, 350); Timber from the Farm Woods Has New Markets in the Pacific Northwest, by H. M. Johnson (pp. 350-353); and Woodlands Cut by the "Selection Method" Less Liable to Fire Damage, by H. T. Gisborne (pp. 376-378).

[**Forestry at the Vermont Station**] (*Vermont Sta. Bul. 380* (1934), p. 17).—Brief mention is made of studies on the silvicultural effect of thinning in 19-year-old white and Scotch pine plantations and on factors causing cell division in the cambium which result in eccentric tree growth.

Forestry in Ireland, J. MACKAY (*Dublin: Ed. Co. of Ireland; London and New York: Longmans, Green & Co., 1934*, pp. 190, pls. 8, figs. 4).—A general study of the forestry situation is presented, with suggestions for future developments.

Studies in tolerance of New England forest trees.—XI, The influence of soil temperature on the germination and development of white pine

seedlings, W. R. ADAMS (*Vermont Sta. Bul.* 379 (1934), pp. 18, pls. 3, figs. 3).—In this contribution (E. S. R., 63, p. 835) the results are presented of controlled greenhouse studies with seedlings grown in zinc cans immersed to various depths in thermostatically controlled water baths. Four series with mean surface temperatures of 57°, 69°, 76°, and 88° F. and mean temperatures of 45°, 49°, 58°, and 87° at 8-in. depths, respectively, were employed.

During three successive seasons it was found that many seedlings failed to survive the summer in the warmest soil, the highest germination and survival occurring in the next lower series. However, the most rapid germination took place in the warmest soil, the mean number of days being 63, 25, 19, and 11, respectively. Variation in root development was much more striking than in tops. By far the largest roots were found in the warmest soil series, these plants developing over twice as many root tips as did the next lot. Determinations of dry matter showed an increase of 46.3 percent in tops and 99.1 percent in roots in the warmest series above the preceding. The mean top-root ratios in the four series, from cool to warm, computed on dry matter content, were 7.24, 2.04, 2.41, and 1.77. The average length of the main roots was by far the greatest in the warmest soil, suggesting to the author that under the forest canopy, where direct insolation is sharply limited, the coolness of the soil may become an important factor in forest succession, distinctly inhibiting the development of white pine. Under such conditions abundant soil moisture may become of little significance.

Influence of the moisture content of slash pine seeds on germination, T. S. COLE (*Jour. Forestry*, 32 (1934), No. 4, pp. 468, 469).—Seeds stored for 2 mo. at 21° C. and constant relative humidities of 30, 70, 90, and 100 percent were found to contain 7.5, 11.5, 22.5, and 32 percent of moisture, respectively. All the seeds contained 9 percent of moisture when placed in the chambers. The percentage germination for seeds of the four lots after 20 days in sand was 0, 0, 2, and 1, respectively. After 300 days the respective germinations were 66, 72, 82, and 73 percent. Holding seeds at high humidities resulted in the development of molds and other pathogens.

Germination of the red spruce, H. I. BALDWIN (*Plant Physiol.*, 9 (1934), No. 3, pp. 491–532, figs. 14).—Field studies in Maine and New Hampshire revealed the importance of available moisture in the germination of red spruce, the highest being secured on sand or mineral soils under the protection of spruce branches or needles. Trenching to remove competing roots increased the percentage of germination. Only a small percentage of duff-stored seeds remained viable for 1 yr., with an occasional seed lasting 2 yr. In airtight dry storage viability decreased about 10 percent per year for the first 3 yr. The optimum range of germination of air-dry seeds was from 24° to 26° C. Afterripening at low temperature lowered the minimum temperature requirements for germination. Light was not found essential but somewhat stimulating. Germination occurred under water when adequately aerated. Germination took place freely between pH 2 and 7, with the best seedlings between 5 and 6. High acidity increased the rate and amount of germination and decreased the losses from mold.

In general conclusion the author states that the wide latitude of conditions permitting satisfactory germination would indicate that natural reproduction of red spruce is dependent not so much on germination requirements as on factors that determine the survival of the resulting seedlings.

Long and short wave-length limits of photosynthesis, G. R. BURNS (*Plant Physiol.*, 9 (1934), No. 3, pp. 645–652, figs. 2).—Utilizing the same apparatus and experimental procedure employed in an earlier study (E. S. R.,

69, p. 506), the author found that white pine and Norway spruce trees are able to utilize all the visible spectrum except part of the blue and all of the violet.

Beaufort scale of wind force as adapted for use on forested areas of the northern Rocky Mountains, G. M. JEMISON (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 77-82).—A comparative study at Priest River, Idaho, of the Beaufort scale of wind force and an improved form of scale developed for use in the mountainous area and here designated as the northern Rocky Mountain scale showed the improved type to be more accurate for use in the forest areas of northern Idaho and western Montana. The improvements in the newer scale were based for the most part on the visible action of wind on grasses, shrubs, trees, flags, smoke, dust, etc. A statistical study of records taken by five individuals using both scales showed a much smaller experimental error with the northern Rocky Mountain scale. Furthermore, the personal error was greatly reduced with the new scale.

The study showed conclusively that for forested areas in the general region this modified form of wind scale is much more accurate than the Beaufort for land use.

Fire resistance in the forest, T. J. STARKER (*Jour. Forestry*, 32 (1934), No. 4, pp. 462-467).—Based on personal observation and a study of the literature, there are presented tables indicating the relative fire resistance of important forest species in Oregon and Washington and also in the northeastern United States.

Poplars, principal tree willows, and walnuts of the Rocky Mountain region, G. B. SUDWORTH (*U. S. Dept. Agr., Tech. Bul.* 420 (1934), pp. [1]+112, figs. 58).—This, the sixth (E. S. R., 39, p. 546) in a series of bulletins on the systematic dendrology of western forest trees, deals with the distinguishing characteristics, habits of growth, and geographic distribution of various poplars, willows, and walnuts. The general text is supplemented by keys to aid in identification and by a comprehensive bibliography of 105 titles.

Identification of the commercial timbers of the United States, H. P. BROWN and A. J. PANSIN (*New York and London: McGraw-Hill Book Co.*, 1934, pp. XXVI+223, figs. 280).—Preceded by a general discussion of the structure of woods, two keys are presented, one based on features visible to the naked eye or hand lens and the other on microscopic characters. In addition the various species are described.

A manual of the timbers of the world: Their characteristics and uses, A. L. HOWARD (*London: Macmillan & Co.*, 1934, 2. ed., rev., pp. XXIII+672, figs. 100).—In this revised edition (E. S. R., 44, p. 239) information is again presented on the structure and utility of woods.

Lumber distribution and consumption, 1932, R. V. REYNOLDS and A. H. PIERSON (*U. S. Dept. Agr., Forest Serv.*, 1934, pp. [2]+30).—In this mimeographed circular tabulated data are presented for the United States by States and regions, based on a canvass conducted cooperatively by this Department, the U. S. Department of Commerce, and the Dominion Bureau of Statistics, Ottawa, Canada.

DISEASES OF PLANTS

Manual of the rusts in United States and Canada, J. C. ARTHUR (*La Fayette, Ind.: Purdue Res. Found.*, 1934, pp. 438, pl. 1, figs. 487).—This important publication is based on many years of work by the author and his associates at Purdue University and the Indiana Experiment Station. It provides a serviceable and authoritative means for the identification of the

Uredinales of the portion of the Western Hemisphere ranging from Greenland to the Aleutian Islands and from Alaska to the Mexican border. It deals with approximately 825 species, among which 128 subtropical rusts that have appeared within the southern limits are given abbreviated treatment. The author has tried to present in the manual, as far as the lineal type of arrangement permits, a classification showing the relationship of species and genera consistent with the present state of knowledge.

The general necessity of using the name of the host plant in rust identification is recognized, and an appended index comprising over 2,000 host names is a valuable complement to the diagnostic keys which are given for the families, tribes, genera, and species.

In order to indicate closeness of relationships, the author has often established as sections, under a given genus, groups of species which might have been recognized as separate genera. Likewise, closely related forms which might have been recognized as separate species are often established as varieties under a common specific name. The author's policy has been to place microcyclic forms under the macrocyclic genera to which they are most closely related, and in some cases, as in the genus *Puccinia*, reduced forms among correlated species are placed after the most completely developed species known and under the same number, without, however, losing their generic or specific identity.

Biological and physiological species or forms, although recognized by the author as important, especially from an economic viewpoint, are not considered in the present work, chiefly to conserve space.

Aside from two deviations, the reasons for which are explained, the author has attempted to abide by the International Rules of Botanical Nomenclature throughout the work.

In connection with each compact species description, the author gives the corresponding reference in the seventh volume of the North American Flora, a list of the more important synonyms with citations, the recorded host range, the known distribution, and a brief record of pertinent culture work that may have been conducted. Each of the 487 clear drawings by G. B. Cummins illustrates the spore forms typical of a particular rust species, generally in surface and median section views, at a uniform magnification of 415 diameters.

The carefully chosen typographic style and arrangement, the thin but opaque and substantial paper, and the method of binding which permits the book, wherever opened, to lie flat on the table, help in making it most useful as a reference work.

Cytology of plant tissues affected by viroses, J. and M. L. DUFRENOY (*Phytopathology*, 24 (1934), No. 6, pp. 599-619, figs. 17).—The authors describe and illustrate the microscopic picture presented by cells of tobacco, iris, and other plants as they develop under the influence of certain viruses. Meristematic tissues in buds or at root tips normally have a high respiratory activity and use up carbohydrates energetically. Viroses slow down the respiratory activity and consequently decrease the rate at which carbohydrates are used up by meristematic cells. As a result, in the postmeristematic cells, where no starch should normally be stored up, mitochondria differentiate into amyloplasts and unused carbohydrates are condensed into starch grains.

In green cells, on the contrary, viroses inhibit the photosynthetic activity but enhance their respiratory, amylolytic, and proteolytic activity. The surfaces of contact between cytoplasm and vacuoles are made larger as the cytoplasm assumes a honeycombed appearance.

The first cytological response of a cell to any of the viroses studied was always a local modification of the cytoplasm, enmeshing a cluster of small

vacuoles wherein phenolic compounds may accumulate. When this local reaction was definite enough to alter markedly the refractive index of the involved cytoplasm and cause it to stain with dyes in the living cell (which the normal living cytoplasm never does), "inclusions" or "vacuolated bodies" were obtained. Viruses seem to shift the pH of the vacuolar solution from the more acid toward the less acid or neutral. What may perhaps be interpreted as virus particles seem to be mostly concentrated within that altered layer of cytoplasm which sheathes them in.

A gall similar to crown gall, produced on gypsophila by a new bacterium, N. A. BROWN (*Jour. Agr. Res. [U. S.], 48 (1934), No. 12, pp. 1099-1112, figs. 4*).—A soft nodular type gall has been found destroying plants of *G. paniculata*. The galls, $\frac{1}{2}$ to 3 cm in diameter, were found in the crown and root. They were creamy white when cut across, with water-soaked areas from which bacteria oozed. A yellow organism was isolated and its infectious nature proved by inoculations into both seedling and grafted gypsophila plants. Galls were formed on the crown and root in less than 2 weeks, and cankers were formed on inoculated stems. Galls were likewise produced on some other plants related to gypsophila, but none on the common hosts of the crown gall organism *Bacterium tumefaciens*, such as daisy, ricinus, and geranium. *B. tumefaciens* did not produce galls on gypsophila.

The yellow, tumor-forming organism (*B. beticola*), which produces the pocket disease of sugar beet, did not produce galls when inoculated into gypsophila, nor did the gypsophila organism produce galls when inoculated into sugar beet. Other distinctions between the two organisms are listed.

A description of the morphologic, physiologic, and cultural characters of the organism is given, and the name *B. gypsophilae* is suggested.

A method to determine the surface area of trees covered by spray fluid and to obtain a permanent record of the degree of fineness of the deposit, C. DAVIES (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 252, 253, fig. 1*).—The method consists in placing in the tree, by means of small spring clips, a number of 2-in. disks of clear celluloid (artificial leaves), suitably randomized. These are collected and studied at leisure.

Zinc proves useful in the control of some plant diseases, M. B. WAITE (*U. S. Dept. Agr. Yearbook 1934, pp. 380-382, figs. 3*).—Reference is made to work of the U. S. Department of Agriculture which disclosed the value of zinc sulfate in a spray mixture for peach trees affected with bacterial spot and its usefulness in pecan plantings for the cure of pecan rosette.

The Plant Disease Reporter, August 15, 1934 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 18 (1934), No. 10, pp. 120-130*).—Among other items of current interest are the following contributions: Bacterial wilt of corn in 1934, by N. E. Stevens; occurrence of peach mosaic in Colorado (Mesa County); downy mildew on the California wild grape, by C. E. Scott; rust (*Uromyces fabae*) of garden peas in Massachusetts; a heath rust (*Uredo ericae* ? on *Erica* sp. in California) new to the United States; observations on the significance of weeds as carriers of the bulb or stem nematode (*Anguillulina dipsaci*) in narcissus plantings, by G. S. Cobb, G. Steiner, and F. S. Blanton; and the early development of dormant colonies of preadult *A. dipsaci* in narcissus bulbs in British Columbia and the significance of their resistance to heat, by R. J. Hastings.

In the latter article, a bulb sterilizing solution developed at the Dominion Laboratory of Plant Pathology in British Columbia is recommended for more extensive tests. One-half lb. of silver nitrate and 1.5 lb. of potassium cyanide are added to 100 gal. of water. In this the infested bulbs are immersed and a vacuum of 25 in. of mercury created, then released.

[Plant disease investigations in Idaho] (*Idaho Sta. Bul.* 205 (1934), pp. 53-56, figs. 2).—In this report are included brief accounts of continued successful development of mosaic-resistant strains of beans, of work looking toward the addition in bean breeding of curly top and bean root rot resistance, of continued testing and selection of strains of alfalfa for resistance to bacterial wilt, of the discovery that snow scald of grains and grasses is caused by an infectious organism, of the cooperation of growers in studying potato viruses, of the work on curly top of tomatoes, and soil infestation in relation to wheat smut control, and on pea root rot and other pea diseases in southern Idaho.

[Plant disease studies in Kentucky] (*Kentucky Sta. Rpt.* 1933, pt. 1, pp. 21-24, 29, 30, 31, 40, 41).—This report includes brief records on the results of investigations on chlorosis in Turkish tobacco due to excess Mn; on mosaic, *Fusarium* wilt, angular leaf spot (*Bacterium angulatum*), black fire (*B. tabacum*), and frenching of tobacco; on stem rot (*Schlerotinia trifoliorum*) and black stem (*Phoma trifolii* n. sp.) of red clover; on clovers resistant to anthracnoses (*Colletotrichum* spp. and *Gloeosporium* spp.) and black patch of clovers caused by an unidentified fungus; on spring dying of sweetclover due to a *Pythium*-like fungus; on black stem disease of alfalfa; and on a study of cane pruning and spraying on raspberry diseases such as leaf spot and cane die-back.

[Plant disease investigations in New Jersey] (*New Jersey Stat. Bien. Rpt.* 1932-33, pp. 57-66).—Under the report of the department of plant pathology, by W. H. Martin, are included brief summaries of the results of investigations during the biennium dealing with the following subjects: Potato spraying with Bordeaux mixture, potato seed disinfection and the use of mercuric fungicides mixed with fertilizers for potato scab and *Rhizoctonia* control, depth of planting and soil moisture content in relation to *Rhizoctonia* attack on potato sprouts, sulfur and copper fungicides for the control of apple scab and Brooks fruit spot, the influence of soil type on the time of maturity of the ascospores of the apple scab fungus, spraying for dewberry anthracnose control, seed treatment for oat smut control, the control of scurf and stem rot of sweetpotatoes, *Verticillium* wilt and fruit rot (*Phomopsis vexans*) of eggplant, nitrogen fertilizer for the control of *Aphanomyces* root rot of peas, control of clubroot of crucifers, susceptibility of sweet corn varieties to bacterial wilt (*Aplanobacter stewartii*), seed transmission of *Fusarium* wilt of tomato and tomato seed treatment, transmission of tomato bacterial canker (*A. michiganense*), testing watermelon varieties for resistance to wilt (*F. niveum*), root treatment of horseradish, beet seed treatment against black root rot (*Phoma betae*), mercurial admixtures in fertilizer for the control of lettuce drop (*Sclerotinia libertiana*), control of seed decay and damping-off in various vegetables, rose black spot [*Diplocarpon rosae*] and brown canker (*Diaporthe umbrina*) control, rose mosaic and resistance thereto, control of gladiolus scab, studies on bacterial canker and leaf spot of English ivy (*Hedera helix*), rhododendron diseases, azalea leaf scorch (*Septoria azaleae*) and its control, corm treatments for the control of calla root rot, the adhesiveness of sulfur sprays, and preliminary studies of miscellaneous diseases of ornamental plants and their control, including those due to *Pestalotia* spp.

The Myriogenospora disease of grasses, W. W. DIEHL (*Phytopathology*, 24 (1934), No. 6, pp. 677-681, figs. 2).—During two seasons' growth *Andropogon scoparius*, received from Louisiana infected by a fungus tentatively identified as *M. paspali*, showed a fasciated and dwarfed condition due chiefly to the mechanical binding of unfolding leaves and stems by the fungus stroma

The diseased shoots were sterile but of a normal green color. The fungus disappeared and the plants recovered. Inoculations of the same host species, as well as of sugarcane and of *Paspalum dilatatum*, were uniformly unsuccessful.

Bunt or stinking smut of wheat in Argentina [trans. title], R. NIEVES (*Bol. Mens. Min. Agr. [Argentina]*, 32 (1933), No. 3, pp. 397-411, figs. 3).—*Tilletia tritici* and *T. laevis* have produced considerable annual loss in Argentina, particularly in the winter wheat area. From 1928 to 1933 the author studied varietal resistance in 934 wheat varieties belonging to 5 subspecies. All Argentine varieties were susceptible. Some foreign varieties (Cooperatorka, Grand, Bolau, Florence, and Rubión) were immune to some physiologic forms of *T. tritici* and *T. laevis*, but susceptible to others. Two physiologic forms were found in *T. laevis* and 6 in *T. tritici*, as shown by their pathogenicity on 21 differential hosts. Forms II and V of *T. tritici* and II of *T. laevis* produce bunt on Petkus rye. Both *Tilletias* produce dwarfing in wheat and rye, but there is considerable varietal influence.

Seed disinfection trials conducted from 1925 to 1933 showed Abavit 26, Uspulun, and Ibis dusts to be highly effective. Breeding work is in progress, but the use of seed disinfection by dry methods is considered more effective and practical because the resistance of immune strains may be broken at any time by unknown physiologic forms introduced from foreign countries, or originated "in situ" by mutation or hybridization.—(*Courtesy Biol. Abs.*)

Wheat leaf rust, R. M. CALDWELL (*U. S. Dept. Agr. Yearbook 1934*, pp. 368, 369, fig. 1).—This reports briefly the results of a cooperative study by the U. S. Department of Agriculture and the Indiana Experiment Station showing that the wide-spread leaf rust of wheat [*Puccinia triticina*], though seldom causing crop failure, reduces the yield somewhat and affects the quality by lessening the protein content. The importance of breeding for leaf rust resistance is emphasized.

Effect of leaf rust (*Puccinia triticina*) on yield, physical characters, and composition of winter wheats, R. M. CALDWELL, H. R. KRAYBILL, J. T. SULLIVAN, and L. E. COMPTON (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1049-1071, figs. 4).—A cooperative study between the Indiana Experiment Station and the U. S. D. A. Bureau of Plant Industry was made at La Fayette, Ind., of the effects of a severe leaf rust epiphytotic in 1931 on the yield and physical characters of the grain and on the chemical composition of the grain and plants of seven varieties of winter wheat of differing degrees of leaf rust resistance and of one very susceptible variety infected with rust in four different degrees of severity. Frequent dusting of control plants with sulfur maintained them in a very lightly rusted condition, while variations in dusting procedure provided a graded series of severities of rust infection on one susceptible variety.

In the very susceptible varieties, with one exception (Fulhard), reductions in yield of grain ranging from 14.8 to 28.4 percent were produced by leaf rust. Yields of straw were similarly affected. Approximately three-fourths of the grain losses resulted from a reduction in number of kernels per head, and the remainder from a reduction in weight per kernel. The test weight per bushel was slightly, though consistently, reduced.

The rust infection resulted in a greatly increased proportion of yellowberry or piebald kernels in hard and semihard varieties, and in the production of more uniformly soft or starchy kernels in the soft wheats. The percentage of protein in the grain of susceptible varieties was very significantly reduced, Fulhard grain, the most affected, being reduced from 12 percent for the control plants to 10.15 percent for the rusted plants. The starch percentage content

of the grain varied inversely with the protein content. Sucrose of the mature grain, although a minor constituent, was consistently reduced.

In contrast to the grain, the combined culms and leaves of the rusted plants contained higher percentages of total nitrogen and, in most cases, greater quantities of total nitrogen than did those of the control plants. These organs of the rusted plants were appreciably lower in concentration of both sucrose and reducing sugars than those of the control plants.

The Fultz selection, which was practically unaffected by the rust, showed 12 percent depression in yield in the sulfur-dusted plots, but no modification of visible characters or composition.

Physiologic specialization in *Puccinia glumarum* in the United States, W. M. BEVER (*Phytopathology*, 24 (1934), No. 6, pp. 686-688).—In this cooperative work by the Idaho Experiment Station and the U. S. D. A. Bureau of Plant Industry, a number of wheat varieties used by G. Gassner and W. Straib in their determination of physiologic forms of *P. glumarum* in Europe, together with some American varieties of wheat and emmer, 14 in all, were inoculated with a culture of stripe rust from a collection obtained from the Flathead Valley, Mont. Another set of the same varieties was inoculated with a culture of stripe rust originating from a collection at Moscow, Idaho. Each of the varieties reacted in much the same way to both collections of rust except Red Russian and Chinese 166, which differed decidedly from the others in their reaction to the two, both being resistant to the Moscow strain and susceptible to the one from Montana. It is concluded, therefore, that the two collections represent two distinct physiologic forms.

The transmission and control of the cereal rusts in Tunisia [trans. title], A. PETIT (*Ann. Serv. Bot. et Agron. Tunisie*, 9 (1932), pp. 201-218).—After several years of study it is concluded that rust infection in Tunisia originates chiefly through persistence of uredia on volunteer plants growing out of season. Preliminary pot tests with a number of liquid and dry materials, under conditions favorable for stripe rust development in the checks, indicated successful prevention of *Puccinia glumarum* attack on wheat without fungicide injury only with repeated dusting with either a precipitated decyanided sulfur or a mixture consisting of 10 percent of this material, 1 percent of paraformaldehyde, 1 percent of cyanamide, and 88 percent of gypsum or lime. In limited field row trials satisfactory results were obtained. Future trials on a more practical basis were projected.

Inheritance of resistance to loose smut and covered smut in some oat hybrids, T. R. STANTON, G. M. REED, and F. A. COFFMAN (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1073-1083, figs. 2).—The results of studies of 6 oat hybrids that involve crosses between varieties differing in their reaction to certain races of the oat smuts are reported. The crosses were Monarch Selection \times Black Mesdag, Richland \times Fulghum, Richland \times Markton, Markton \times Iogold, Markton \times Black Mesdag, and Cornellian \times Markton, and F_2 plants of all these crosses were inoculated with 3 specialized smut races. Progenies of all 6 crosses inoculated with *U. avenae*-Missouri, progenies of 5 crosses inoculated with *U. levis*-Missouri, and progenies of 1 cross inoculated with *U. avenae*-Fulghum were grown in F_3 , and their reaction to these smuts was recorded. The results for the hybrids of the Monarch Selection \times Black Mesdag cross inoculated with *U. avenae*-Missouri indicate that smut resistance is inherited on the basis of a 3:1 ratio. It is noteworthy that considerable smut infection occurred in some F_3 progenies of hybrids descended from entirely resistant parents. In most of the hybrids completely resistant progenies predominated over segregating progenies. Very few susceptible progenies were observed.

Variability in *Pythium arrhenomanes* in relation to root rot of sugarcane and corn, R. D. RANDS and E. DOPP (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 3, pp. 189-221, figs. 12).—The results are presented of comparative laboratory and greenhouse studies of 70 isolates of *P. arrhenomanes* Drechsler, mainly from sugarcane in Louisiana and Florida but including strains from corn root rot in Wisconsin, Indiana, Kentucky, and Missouri; from the cereal root-browning diseases in Saskatchewan, Canada; from sugarcane in Hawaii and Mauritius; and from other hosts in Hawaii. It is considered by the authors that important constant and distinctive characteristics of the sexual organs unquestionably classify all of the cultures as *P. arrhenomanes*, despite wide differences in morphology and physiology, including relative virulence to both sugarcane and corn. Nine of the recently described *Nematosporangium* "species" of C. P. Sideris are also included under this species. Although the differences in virulence and other characters (due possibly to hybridization) are of a magnitude commonly employed for differentiating physiologic forms in other fungi, intermediate or overlapping representatives are held to nullify for the present, at least, any practical advantage of subspecific groupings. It is urged that differences in virulence and geographic distribution of strains should be considered in the breeding of fully resistant varieties.

Testing alfalfa for resistance to bacterial wilt, F. R. JONES (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1085-1098).—In cooperative studies between the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry, procedures were tested out in growing and inoculating alfalfa plants so as to be able to pick out within a year individuals resistant to bacterial wilt (*Phytophthora insidiosa*). These methods are described and compared in effectiveness. Resistance appears to occur in varying degree, reaching apparent immunity in occasional individuals. A tentative classification of resistant plants into immune, highly resistant, and resistant is proposed. Alfalfa from Turkistan and some surrounding territory has more resistant plants than that from any other region from which plants have been tested thus far. Resistance appears to be exhibited chiefly in the parenchymatous tissue, where the bacteria make little or no progress between the cells in resistant plants. It has not been found correlated with morphological characteristics of resistant plants. Increased resistance in open pollinated progeny of some of the selected resistant plants has been obtained.

Resistance to common bean mosaic in the Great Northern field bean, W. H. PIERCE (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 2, pp. 183-188, figs. 2).—Selected single-plant strains of Great Northern beans were tested in the field and greenhouse at the Idaho Experiment Station for resistance to common bean mosaic. A number of resistant strains were found. The results of the resistance tests, yield data, and agronomic field notes over a 3-year period are given for nine resistant strains and one susceptible commercial lot. The yields of the resistant strains were significantly higher than the yield of mosaic-infected Great Northern. Three of the resistant selections (UI Nos. 1, 59, and 81) are being grown commercially in Idaho.

The downy mildew of the hop in 1933, E. S. SALMON and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent*, No. 34 (1934), pp. 107-113).—Attacks by downy mildew in England were severe in the early part of the season in the form of "basal spikes" and in May as "terminal spikes." In certain districts the growth of the bine was seriously damaged. The phenomenally hot, dry weather of June, July, and August reduced the fungus, generally speaking, to a nonsporulating condition, and a healthy crop was secured in all districts, though the disease could be found lurking in dried-up spikes or on the under

surface of leaves high up. In 1933 some three-quarters of the hop acreage was sprayed with Bordeaux mixture. At least three applications of home-made Bordeaux mixture were advised for all hops in 1934, no matter how hot and dry the season might be.

Fusarium disease of peas, J. C. WENT (*Fusarium-aantastingen van erwten. Proefschr., Rijks-Univ., Utrecht, 1934, pp. [8]+83, pls. 2, figs. [17]; Eng. abs., p. 78*).—In late June in the large pea fields in the Netherlands plants frequently turn yellow and die prematurely, due to a prevalent disease known as "St. John's disease", which has previously been attributed to *F. vasinfectum pisi* v. Hall (section *Elegans*). From such diseased plants, however, *Fusaria* belonging to the section *Martiella*, especially varieties of *Fusarium solani*, were most frequently isolated. *Fusaria* belonging to the section *Roseum*, like *Fusarium herbarum* and *F. anguioides*, were also often met with in the isolation cultures. *F. oxysporum* (section *Elegans*) and *F. equiseti* (section *Gibbosum*) were isolated only in very few instances.

The author proved that more than one species of *Fusarium* may cause this trouble. The most serious symptoms of disease were induced by *F. solani striatum* (Sherb.) Wr., *F. solani martii* (App. et Wr.) Wr., and *F. oxysporum* Schlecht. However, *F. solani medium* Wr., *F. equiseti* (Cda.) Sacc., *F. herbarum* (Cda.) Fries, *F. herbarum viticola* (Thüm) Wr., and *F. anguioides* Sherb. proved to be less virulent.

The development of the disease is largely influenced by the water supply, and especially by the temperature. Large additions of water just after the inoculation has been performed increase the seriousness of the disease. All varieties of peas examined proved to be more or less susceptible to most of the above-mentioned *Fusaria*. *Fusarium culmorum* (W. G. Sm.) Sacc. causes quite a different type of disease on peas. Very young plants (with 2-4 leaves), when inoculated with this fungus, show symptoms of wilting within a short time. *Fusaria* do not penetrate the pea plant by means of the intercellulars, but through the epidermal cells or the root hairs.

A comparative study of certain tissues of giant-hill and healthy potato plants, H. D. HILL (*Phytopathology, 24 (1934), No. 6, pp. 577-598, figs. 9*).—This contribution from the Pennsylvania Experiment Station reports a comparative anatomical study which shows that the macroscopic characters of giant hill plants, namely, the unusually tall, stiffly erect, and compact appearance, with excessive axillary branching and coarse-looking foliage, are correlated with histological abnormalities, including thinner leaf laminae, smaller palisade cells, slightly greater inner phloem, and slightly less outer phloem in the petioles, but considerably less inner phloem in the plant stems than in the healthy plants. It is suggested that these disorganizations of photosynthetic and conducting tissues are of related order to, though of less degree than, those produced by some other virus diseases.

Magnesium deficiency in certain soil types reduces potato yields, B. E. BROWN (*U. S. Dept. Agr. Yearbook 1934, pp. 258-261, figs. 2*).—This is a popular discussion of the potato disorder caused by lack of available Mg in certain soils which has resulted in serious decreases in yields in various localities along the Atlantic Coastal Plain. The yellowish color and other symptoms are described, and the results of cooperative studies by the U. S. Department of Agriculture and several States are summarized. The employment of Mg in fertilizer or lime materials, the increasing of organic matter, and judicious decreasing of soil acidity are suggested for regions subject to this trouble.

Relation of the potato flea beetle to common scab infection of potatoes, L. A. SCHAAL (*Jour. Agr. Res. [U. S.], 49 (1934), No. 3, pp. 251-258,*

figs. 4).—Larvae of the potato flea beetle (*Epitrix cucumeris*) make worm tracks on potato tubers that often become infected by *Actinomyces scabies*. Part of the infection may result from direct contact of infected soil with the worm track, but experiments conducted at Greeley, Colo., showed that the scab organism was carried by the larvae both internally and externally. Eggs disinfected with HgCl_2 produced sterile larvae. When these were allowed to feed on tubers growing in sterilized soil, their feeding tracks did not become scab infected. When sterile larvae were placed in infected soil, they made tracks on the tubers that became infected. Infected worm tracks were greatly reduced by seed treatment with HgCl_2 .

Carbon dioxide formation by clean and scabby potatoes, B. F. LUTMAN (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1135-1144, figs. 2).—In this work at the Vermont Experiment Station, the respiration records of 2 lots of clean tubers and 2 lots of scabby tubers were studied through a storage period of 159 days. The respiration rate was obtained in each case by 2 different methods: (1) By passing the CO_2 -free air through the bell jars in which they were kept and absorbing the respired CO_2 by an alkaline solution and (2) by withdrawing 10 cc samples and determining the percentage of CO_2 with a Haldane apparatus. During the first months of storage the respiration rates of the scabby tubers were much higher than those of the clean tubers. The rates tended to become equalized between January and February, but in March, after sprouting began, the clean tubers respired more than the scabby ones, sprouting being delayed from 7 to 10 days in the scabby lots. The respiration rates obtained by the first mentioned method were uniformly higher than those obtained by the other method. The possible reasons for the difference are suggested. The small amount of CO_2 accumulated in the bell jars in the Haldane apparatus was not sufficient to check respiration, from 7 to 9 percent being required to check it. The amount of CO_2 at the bottom of a bin filled with tubers to the depth of 5 ft. was practically that of the surrounding air during the storage season until the tubers began to sprout, when as high as 1.8 percent occurred at the bottom with a temperature of about 50°F .

Tobacco-disease control necessitates a wide variety of measures, E. E. CLAYTON (*U. S. Dept. Agr. Yearbook 1934*, pp. 353-355, figs. 2).—This is a very brief popular discussion of the most important tobacco diseases in the United States, and of the various control measures which may be used for defense against them.

Contaminated soil and cultural practices as related to occurrence and spread of tobacco mosaic, S. G. LEHMAN (*North Carolina Sta. Tech. Bul. 46* (1934), pp. 43, figs. 6).—In experiments extending over four seasons on the factors of importance in the control of common tobacco mosaic, it was found that under North Carolina conditions a single tobacco crop affected with mosaic left in the soil more or less contaminative material carrying the virus. If new plants were set in this soil the following year, some of them usually became diseased, but the virus did not appear to accumulate in the soil with several successive diseased crops. The virus did not seem to move from the tobacco plant into the soil itself, but mainly to reside in old plant parts lying in or on the soil.

Disking the land to uproot and cut up the plants in the fall and thus promote their early death and decay proved almost as effective as their complete removal in reducing initial infection from the soil. More disease occurred when the plants were not disked into the soil until spring. Apparently the virus became inactivated as the diseased plant refuse decomposed and mixed more intimately with the soil. Therefore, uprooting and disking in the fall are

recommended. Deep coverage by plowing in the fall was found to preserve some of the plants sufficiently to enable them, in the following spring, to form new diseased sprouts from which mosaic could readily spread to newly set plants.

The author believes that the danger of infection from a previously diseased crop becomes nil after the lapse of one growing season if no susceptible plants are allowed to grow on the land. However, it appears from the facts in hand that in case it is not practicable to leave tobacco off the land for a year, a new crop may be placed on the infested land without danger of more than trifling loss, provided that before each cultivation the few plants which become diseased are removed.

It was demonstrated that young plants may become diseased as a result of careless use of chewing or smoking tobacco while handling them. It was found that mosaic was increased by indiscriminate topping of diseased and healthy plants as compared with topping of the healthy ones before touching those that were diseased. Mosaic was spread extensively in cultivation after the plants had become large enough to rub the implements as they passed. The cumulative effect of the spread of mosaic in connection with cultural operations resulted, in observed cases, in surprisingly high crop infestations by the end of the season. Starting with as few as 5 percent affected at the beginning, after two cultivations from 10 to 15 times as many plants showed the disease.

In the introduction the disease is discussed, and its characteristic symptoms and effects, as well as the losses which may result from it, are described.

Practices relating to control of tobacco mosaic, S. G. LEHMAN (*North Carolina Sta. Bul.* 297 (1934), pp. 8, figs. 3).—This is a popular edition of the foregoing.

Spotted wilt disease of tomatoes, E. H. SMITH (*Gard. Chron.*, 3. ser., 94 (1933), No. 2445, p. 350, figs. 3).—This article describes and shows photographs of the effect of the disease as it appeared on leaves and fruit of tomatoes in an English greenhouse in 1933, where it apparently occurred also on dahlias, nasturtiums, and snapdragons. Thrips were present.

Spotted wilt of tomatoes (*Expt. and Res. Sta., Cheshunt, Herts, Circ.* 7 (1933), pp. [3]).—A popular description is given of the symptoms of this virus disease recently appearing in English greenhouses as it occurs on tomato, dahlia, zinnia, aster, chrysanthemum, cineraria, potato, winter cherry, black nightshade, lupine, garden nasturtium, and common plantain. Other reported hosts listed are tobacco, eggplant, pepper (*Capsicum annuum*), Jimson weed, henbane, *Physalis*, salpiglossis, schizanthus, Iceland poppy, broadbean (*Vicia faba*), and *Campanula pyramidalis*. Instant removal and burning of diseased plants on discovery is recommended, as well as the control of *Thrips tabaci*, known vector of the disease.

A disease-resisting turnip, W. M. FINDLAY (*Scot. Jour. Agr.*, 14 (1931), No. 2, pp. 173–183, pl. 1).—In tests of many varieties of turnips and swedes, conducted for several years on ground thoroughly infested with *Plasmodiophora brassicae* on which turnips had grown continuously for 16 yr., no really resistant varieties were found until a variety, now named Bruce, in preference to other popular names, was tested and found resistant, to a marked degree, to the finger-and-toe (clubroot) disease. This is a purple top, yellow-fleshed variety of superior keeping quality that had been grown for nearly 100 yr. in Aberdeenshire, Scotland. Its origin is unknown. The typical characteristics of the variety, its excellent cropping capacity, its seed size, and disease resistance are reported. Different seed stocks of the Bruce turnip were found to vary in the degree of resistance exhibited. Farmers are ad-

vised to grow their seed stock of the Bruce on a clubroot-infested piece of ground in an effort to maintain resistance, or even increase it by the constant elimination of individuals lacking this quality.

An investigation of factors affecting the incidence of lenticel infection of apples by *Penicillium expansum*, K. F. BAKER and F. D. HEALD (*Washington Sta. Bul.* 298 (1934), pp. 48).—The studies here reported were conducted from 1930 to 1934 with the object of obtaining information which might be useful in the better prevention of blue mold infection, one of the most general causes of decay in stored apples. Survey work indicated that there were orchards in the State of Washington where severe lenticel infection occurred every year, and others where only occasional losses were sustained, these ranging from heavy losses to almost none.

In commercial production the amount of lenticel infection appeared to depend generally upon a combination of favoring conditions, of which the most important seemed to be the susceptibility of the lenticels, next the number of blue mold spores present on the fruit, and last the operation of factors influencing the process of infection, such as the volatile products of the fruit, exosmosis of nutrients through uncutinized lenticel cells, juice from decayed fruit, and the acid condition of the moisture on the surface. The degree of penetration of methylene blue dye through fruit lenticels was found to be a valuable index to the susceptibility of a given lot of apples to lenticel infection.

Under central Washington conditions the susceptibility of the lenticels to infection was found to be increased by delayed picking and by storage of fruit at 0° C. previous to washing in heated solutions (43°–49°). Lenticels in bruises and pressure spots were more subject to infection than those in uninjured areas. The amount of lenticel infection was decreased as a rule where harvested fruit was held dry for a few days at orchard temperatures and was decreased in all cases by artificial dry-heat treatment.

Presumptive evidence is presented that the promotion of lenticel infection by contact with adjacent decayed apples is due to enzymatic action on the uncutinized cells of susceptible lenticels, as well as to stimulus of spore germination. Cold storage was found not to prevent infection, but merely to retard the development of decay.

The authors suggest avoidance, as far as practicable, of the numerous conditions known to predispose to lenticel infection. It is not thought likely, however, that cultural practices can be so modified under commercial conditions as to reduce the number of susceptible lenticels to the point of complete prevention of lenticel infection.

Soft scald and soggy break-down of apples, C. BROOKS and C. P. HARLEY (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 55–69, figs. 8).—Tests showed that soft scald and soggy break-down were both increased by delayed entrance into cold storage. Accumulated soft scald tendencies were largely eliminated by coating the fruit with a mixture of mineral oil and paraffin or by short-period prestorage exposure to partial vacuum, to high temperature (95° to 110° F.), or to carbon dioxide gas at concentrations ranging from 17 to 34 percent. Accumulated soggy break-down tendencies made a similar response to carbon dioxide treatments. The carbon dioxide treatments decreased the rate of softening of the fruit in storage and had no objectionable effect upon flavor or quality.

The control of apple scab: Allington Pippin and Newton Wonder, 1933, W. GOODWIN, H. MARTIN, E. S. SALMON, and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent*, No. 34 (1934), pp. 136–144).—In 1933, in Kent, trees of Allington Pippin sprayed with home-made Bordeaux mixture (2

prebloom and 2 postbloom applications) gave 7.8 percent of scabbed apples. Those sprayed similarly with cottonseed oil-Bordeaux emulsion gave 7.2 percent of scab, and unsprayed controls showed 80.3 percent. Newton Wonder, however, showed 39.1 and 35.6 percent of scab, respectively, with the sprays above mentioned as compared with 92.4 percent for the checks. Cottonseed oil-Bordeaux emulsion caused less russetting than ordinary Bordeaux mixture and is deemed worthy of trial on a commercial scale. In making it, 6 pt. of cottonseed oil and 4 gal. of 10 percent copper sulfate solution were added simultaneously to 95 gal. of water containing 6 lb. of hydrated lime. The oil readily emulsified.

Spraying experiments against pear scab, H. MARTIN, E. S. SALMON, and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 145-154, fig. 1*).—The results are reported of a spraying experiment conducted in Kent, England, in 1933 on four varieties of pear, using hydrated lime-Bordeaux mixture in comparison with cottonseed oil-Bordeaux emulsion. All plats received 1 preblossom spray and either 2 or 3 postbloom sprays. No appreciable fruit russetting of the Williams Bon Chrétien was caused by either spray, but a slight skin roughness of the Marguérite Marillat resulted from the Bordeaux mixture. Both Bordeaux mixture and Bordeaux emulsion caused damage to the foliage of the varieties Marguérite Marillat and Doyenné du Comice, but only straight Bordeaux mixture caused any injury (slight) to the foliage of Louise Bonne or Williams.

No difference in degree of scab control was noted between the two types of spray. Three postbloom sprays gave considerably better scab control than 2 applications after bloom. The conidial stage of pear scab was found, often in abundance, on the young wood of all these varieties except Marguérite Marillat.

Nectar and rain in relation to fire blight, H. E. THOMAS and P. A. ARK (*Phytopathology, 24 (1934), No. 6, pp. 682-685*).—This contribution from the California Experiment Station reports that in culture solutions containing sucrose, dextrose, and levulose the growth of *Bacillus amylovorus* is optimum at 10 percent or less and is inhibited at 18 percent concentration of the reducing sugars which seem to predominate in pear nectar. Under dry weather conditions in California the nectar of pear blossoms taken from bees in the afternoon was found to contain from 38 to 50 percent of total sugar, while the nectar from pear blossoms that had been kept in a highly humid moist chamber for 63 hr. contained less than 2 percent. Inoculated blossoms held in dry atmosphere developed little or no blight, while those kept in a moist atmosphere blighted freely. These facts are held to indicate that high atmospheric humidity (irrespective of precipitation) plays an important role in the epiphytology of fire blight.

Control of strawberry leaf blights in Louisiana, A. G. PLAKIDAS (*Louisiana Sta. Bul. 252 (1934), pp. 17, figs. 5*).—This is a revision of Bulletin 225 (E. S. R., 66, p. 48). It describes the nature and control of leaf spot (*Mycosphaerella fragariae*) and of scorch (*Diplocarpon earliana*), and reports comparative tests between standard Bordeaux mixture and the so-called "Instant Bordeaux" in which both appeared about equal in 1933, while the yield with Instant Bordeaux was distinctly lower than that with the standard mixture in 1934. Summer spraying, good drainage, and the dipping of tops in standard Bordeaux mixture at the time of planting in the fall are suggested as supplementary control practices.

The mode of infection of *Diplocarpon earliana* and *Mycosphaerella fragariae*, A. G. PLAKIDAS (*Phytopathology, 24 (1934), No. 6, pp. 620-634*,

figs. 4).—Inoculation tests with pure cultures showed that infection with both these strawberry pathogens takes place predominantly, if not wholly, through the lower leaf surface. With *Diplocarpon* the germ tube was found to enter by direct penetration between the epidermal cells, never through the stomata. Haustoria were found, but no subcuticular mycelium. In the case of *Mycosphaerella*, ingress was found to take place through the stomata, never otherwise. Leaves of the Klondike variety, the main one used in the tests, were found to have stomata in the upper epidermis, but in much smaller numbers than beneath. No correlation was found between the number of stomata and susceptibility or resistance to *Mycosphaerella* in the six varieties studied.

The rosette disease of blackberries and dewberries, A. G. PLAKIDAS (*Louisiana Sta. Bul.* 250 (1934), pp. 8, figs. 2).—The rosette disease is described and illustrated. It is considered to be identical with the so-called "double-blossom" disease attributed to *Fusarium rubi*. The causal agent of the rosette disease in Louisiana, however, is apparently an undescribed species of *Cercospora*. The disease has been repeatedly produced by artificial inoculations with pure cultures of this fungus.

Infection was found to take place in the spring in the terminal and lateral buds on the new canes (primocanes). These grow normally during the summer, exhibiting no external symptoms, but during the following spring the infected buds give rise to a rosette or witches'-broom type of growth. The blossoms from rosette shoots do not set fruit. The infection period was determined for Louisiana conditions to extend from about the middle of March, when the spores begin to form on the diseased blossoms, to about the first week in June. Infection did not occur after this period, even though an abundance of spores was present on the withered blossoms until the end of August.

Bordeaux mixture 4-4-50 effectively controlled the disease where the primocanes were kept sprayed during the infection period. According to the recommended plan of control the primocanes are cut off at the ground about the first week in May. This eliminates all the growth that may have become infected up to this time. The subsequently formed new canes are then kept sprayed with Bordeaux mixture about every 10 days until the period of infection has passed (early June).

Control of dewberry anthracnose by spraying, C. M. HAENSELER (*New Jersey Stat. Bul.* 574 (1934), pp. 12, fig. 1).—The results are reported of tests conducted for four seasons against *Plectodiscella veneta* on dewberries (*Rubus* sp.). Concentrated lime-sulfur 1-20 (1-10 if scale is severe) applied when the leaf buds were from $\frac{1}{4}$ to $\frac{1}{2}$ in. long, followed by 2.5-5-50 Bordeaux mixture applied about a week before blossoming gave the best yield increases over the controls (39 and 33 percent in 1931 and 1932, respectively) and resulted in improved fruit quality. Under New Jersey conditions the greatest benefit resulted from reduced infection of inflorescence and fruit, but important benefit resulted also from reduced infection of new canes. Insoluble sulfur sprays used at the preblossom stage did not give as consistent control as Bordeaux mixture. Lime-sulfur 1-40 at that stage resulted in lower yields and reduced berry size, although anthracnose control was satisfactory.

The disease is described, and its development in relation to that of the host is briefly discussed.

Citrus fruit resists stem-end rot better by newer borax treatment, J. R. WINSTON (*U. S. Dept. Agr. Yearbook* 1934, pp. 161, 162).—Stem-end rot [due to *Diplodia natalensis*] was best controlled in experiments by using, as soon after picking as practicable, an 8 percent solution of borax at 100°-110° F., the fruit being not colder than 90° when treated. Refrigeration is advised in warm weather.

A study of the root-knot-nematode trap crop under field soil conditions, G. H. GODFREY and H. R. HAGAN (*Phytopathology*, 24 (1934), No. 6, pp. 648-658).—Experimental plats of Hawaiian pineapple field soils, 4 by 8 ft. in dimensions, separated by galvanized iron sheets 2 ft. deep in the soil, sealed at the corners, and heavily inoculated with root knot nematodes (*Heterodera marioni*), were subjected to a series of successive plantings of cowpeas (*Vigna sinensis*) and grass peas (English peas) (*Lathyrus sativus*) in an attempt to attract and trap the nematodes from the soil. The plants were always turned under or removed before the development of a new generation of nematodes, thus destroying those established in the roots. The first two plantings removed all but a bare trace of infestation, but some survival occurred in the deeper soil that was not reached by the roots in the short period of plant growth that was permissible. The method, however, may prove to be of some practical value in connection with other means of nematode control. Trap crops were satisfactorily killed with sodium arsenite sprays. In field trials, successive plantings of trap crops beside the pineapple plant row did not show effective reduction in the amount of ultimate infestation of the pineapple plants as compared with rows not so treated.

A new peony fungus [trans. title], V. BONGINI (*Bol. Lab. Sper. Fitopat. [Torino]*, 29 (1934), No. 4, pp. 109-121, figs. 9).—A brown spotting of peony foliage, developing during hot, moist weather in northern Italy, was found to be caused by an undescribed fungus (*Sphaeropsis paeoniae* n. sp.), of which the Latin diagnosis is given. The spores are continuous (very rarely 1-septate), hyaline at first, then olivaceous, and with age brown, guttate, $20-25 \times 10 \mu$, with fairly heavy wall. The disease is sporadic and does not always sporulate on the host. Its development and spread are favored by warm, humid, climatic conditions and temperature fluctuations. Bordeaux mixture provided adequate control.

Outbreaks of the Dutch elm disease in the United States, C. MAY (*U. S. Dept. Agr. Circ. 322* (1934), pp. 19, figs. 13).—This circular records the known status of the elm disease caused by *Ceratostomella ulmi* in the United States up to the spring of 1934 and summarizes the chief facts as to the importance of elms in this country, the susceptible species, distribution, probable source of the disease in the United States, its symptoms, causal organism, its mode of transmission by elm bark beetles, its development in the attacked trees, and its severity.

The importance of a concerted, well-planned, and sustained effort to eradicate the disease from America by a program involving the detection and immediate destruction of all diseased trees is brought out. The sending of specimens from trees suspected of the disease in any part of the country to an official laboratory for cultural diagnosis is urged as an important aid to the detection of new infection centers.

Dutch elm disease now serious around New York; entered country in logs, R. K. BEATTIE (*U. S. Dept. Agr. Yearbook 1934*, pp. 188-190, figs. 2).—A brief account is given of this disease and the campaign to effect its eventual eradication.

Second addendum to studies on symbiosis, susceptibility to parasitic attack, and inheritance of pathological characteristics in our woody plants.—III, Investigations on growth rate, moisture content, wood quality, attack by disease, and deterioration of spruces tapped for resin. Investigations on tapped spruces [trans. title], [C] VON TUBEUF (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 43 (1933), No. 8-9, pp. 476-484, figs. 9).—Continuing work previously reported (*E. S. R.*, 71, p. 64), records are given on the determi-

nation of 50 spruce trees tapped in the spring of 1916, each carrying four blazes 1.1–1.5 m long. Of these, 28 trees were decayed in the trunk, 5 with *Trametes radiciperda* which advanced upward from the roots, and 5 with an unidentified fungus of similar origin. The remaining 18 showed decay originating from the tapping blazes. The tapped trees showed a very great increase in decay over the neighboring unworked trees. In a single 130-year-old, severely infested tree, blown down, the decay caused by *T. radiciperda* extended to a height of 7 m, at which level the decay involved but 2.4 percent of the cross section.—(Courtesy Biol. Abs.)

Studies on symbiosis, susceptibility, and inheritance of pathological characteristics in our woody plants.—IV, Susceptibility to attack by *Cronartium ribicola* on the part of the 5-needled species of pine and of the different genera, species, hybrids, and horticultural forms of *Ribes* [trans. title], [C.] VON TUBEUF (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 43 (1933), No. 8–9, pp. 433–471).—Inoculation tests of *C. ribicola* on over 400 species, varieties, and hybrids of *Ribes* and *Grossularia* are recorded for 1928–32, with the list by Spaulding (E. S. R., 47, p. 154) appended for comparison. Only a small number proved to be immune, including 9 cultivated varieties and hybrids of *Ribes* and 11 species or varieties of *Grossularia*. Observations are also recorded on the susceptibility of 156 garden varieties of gooseberries to *Sphaerotheca mors-uvae*, of which 9 remained free during 1931 and 1932. A discussion follows on the susceptibility of the various species of 5-needle pines to blister rust, with a concluding key to the species.—(Courtesy Biol. Abs.)

Seasonal development of *Ribes* in relation to spread of *Cronartium ribicola* in the Pacific Northwest, H. G. LACHMUND (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 2, pp. 93–114, figs. 2).—In western United States and Canada the white pine blister rust spreads each spring over great distances to wild and cultivated currants and gooseberries by means of wind-carried aeciospores. Experiments were undertaken to obtain information bearing on the question as to whether the degree, extent, and direction of this spread may not be governed largely by the stage of susceptibility of the leaves of these host plants at the time the main body of aeciospores is produced. In the vicinity of Kelowna, in southern British Columbia, in 1928, inoculations were made in the field by uniform methods during weather favorable to infection on over 1,300 leaves ranging in age from 2 to 44 days borne on plants of the four chief species of *Ribes* in the commercial western white pine belt (*R. petiolare*, *R. inerme*, *R. viscosissimum*, and *R. lacustre*).

It was found that the leaves reached their greatest susceptibility between the ages of 2 and 16 days, after which susceptibility decreased considerably except in the case of *R. viscosissimum*. This is contrary to previous opinion based on studies elsewhere that the leaves of *Ribes* spp. in the earliest stages are remarkably resistant.

According to the records, ribes leaf development seems to be more affected by variations in seasonal conditions than is the time of aeciospore production. The author, therefore, points out that the most favorable period for spread of the disease by the pine-borne aeciospores would occur when the period of maximum spore dispersal coincides with that in which the largest proportion of the ribes leaves lying within the range of aeciospore spread are in the most susceptible stages. In an early spring the development of ribes leaves is advanced until they are past maximum susceptibility when maximum aeciospore production is taking place in the same locality. This would restrict infection near the aeciospore source and interfere with spread to lower elevations and to the south, but it would favor spread to the north where spring

is later and the host leaves are more susceptible. The author considers that a late spring would have the opposite effect.

Damage to *Pinus monticola* by *Cronartium ribicola* at Garibaldi, British Columbia, H. G. LACHMUND (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 3, pp. 239-249, figs. 3).—Yearly examinations were made between 1922 and 1931 of the increase of infection and resultant injury to western white pine from the white pine blister rust on three small plats located about 60 miles north of Vancouver. The first plat, with trees averaging about 20 ft. high, was located in a heavy concentration of *Ribes bracteosum* and *R. lacustre*; the second, with trees up to 95 ft. high, was located at the edge of this; and the third, with pines averaging about 20 ft. high, was located approximately 300 yd. away. On plat 1, within 16 yr. after the entry of the rust to the locality, nearly 100 percent of the trees up to 45 ft. were killed; on plat 2, after 18 yr., trees up to about 70 ft. in height showed 65.8 percent mortality, and the rest were expected to succumb within a few years; and on plat 3, after 18 yr., only about 11 percent were dead. The killing on the first two plats resulted almost entirely from crown killing by innumerable twig and branch infections. The intensity of pine infection and death rate decreased rapidly with the distance from the infection source. The ribes plants survived infection that destroyed the pines.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions by the U. S. Department of Agriculture on beneficial and injurious animals] (*U. S. Dept. Agr. Yearbook 1934*, pp. 231, 232, 299, 300, 308-313, figs. 3).—The results of work with animals are here presented in practical form as follows: Fur-Bearing Animals May Be Increased by Wise Management and Protection, by L. H. Douglas (pp. 231, 232); Predator-Trap Device Safeguards Species That Are Harmless, by A. M. Day (pp. 299, 300); Rat Baits Canned to Aid Cooperative Antirat Campaigns, by J. Silver (pp. 308-310); and Restocking of Marshes with Hand-reared Mallards not Proved Practicable, by F. C. Lincoln (pp. 310-313).

A preliminary survey of the food of Oregon trout, R. E. DIMICK and D. C. MOTE (*Oregon Sta. Bul. 323* (1934), pp. 23, figs. 15).—The progress of studies of fish food, conducted in cooperation with the Oregon State Game Commission, is reported.

In investigations of the diet of the more common Oregon species of trout, examinations were made of the stomach contents of 326 cutthroat trout (*Salmo clarkii clarkii* R.); 122 rainbow trouts (*S. gairdneri irideus* G.); 23 steelhead or sea-run rainbow trout (*S. gairdneri irideus* Gibbons); and 25 eastern brook trout (*Salvelinus fontinalis* M.), an introduced fish. The stomachs were from fish caught either by nets, baited spinners, baited hooks, or artificial flies in lakes and streams in various parts of the State. No differences in the amounts or kinds of food organisms could be found in the stomachs of fish netted or caught on a hook. The food found in the stomach contents of cutthroat, rainbow, and eastern brook trout consisted, in the main, of animal organisms.

The results, which are summarized in tabular form, are considered more at length under the heading of the animal and plant foods found in the stomach. Insects were found to be the dominant food organisms in the diet of cutthroat and rainbow trout in the streams and lakes of the State, those of aquatic origin forming the bulk of the food during all seasons of the year. Insects of terrestrial origin were found to be prominent in the diet of trout during the spring, summer, and fall months. The aquatic insects of importance in the

diet of Oregon trout include May flies, stone flies, caddis flies, midges, and black flies. Crawfish, small fish, and pieces of dead salmon are important items in the diet of the larger trout. The immature stages of black flies and midges are important items in the diet of small trout in streams, while in lakes the diet of small trout is mainly composed of immature midges and water fleas. Fresh-water shrimps are important items in the diet of Oregon trout in lakes, especially in lakes in which the eastern brook trout thrives.

Suggestions for fish liberations are included.

Some diseases of Oregon fish and game and identification of parts of game animals, J. N. SHAW, B. T. SIMMS, and O. H. MUTH (*Oregon Sta. Bul.* 322 (1934), pp. 23, figs. 18).—Studies of the diseases of Oregon fish and game, commenced in 1925 and conducted in cooperation with the Oregon State Game Commission, are reported. Work with parasites of fish takes up the greater part of the account (pp. 5–20), followed by brief discussions of the parasites of fish-eating birds, parasites of deer (*Odocoileus columbianus*), and other diseases of deer and the identification of parts of game animals such as may be found in the possession of game law violators. Parasites of fish are considered under the headings of the salmon poisoning fluke (*Nanophyetus salmincola* Chapn.); parasites of fish in Elk Lake; rainbow (*Salmo gairdneri irideus* Gibbons), cutthroat, and steelhead (*S. gairdneri irideus* Gibbons) trout; Chinook (*Oncorhynchus tshawytscha* Walb.) and silverside salmon; and trash fish, respectively.

In summarizing the report it is pointed out that parasites have been found in every important species of game fish which occurs in Oregon, but that in most instances these parasites do no serious damage if they are present in only small numbers. Some of the fish-eating birds are carriers of parasites which live a part of their lives in fish. Such birds may severely contaminate lakes and streams. Since the life cycles of many of the parasites of fish are unknown, further studies are necessary if methods of control are to be worked out. Parasites may become so numerous as to cause poor condition and losses among deer. While other diseases of deer are known to exist in Oregon, they are seldom found.

[Report of oyster investigations by the New Jersey Stations], T. C. NELSON (*New Jersey Stas. Bien. Rpt.* 1932–33, pp. 16–22).—The more important results of investigations in 1932 and 1933 are considered under the headings of hydrography, the setting of oysters, studies of the food and feeding of oysters, and the trapping of oyster drills.

Controlled water storage and conditioning of oysters for market, J. R. NELSON (*New Jersey Stas. Circ.* 322 (1934), pp. 8).—This practical account deals with the problem of conditioning oysters and the experimental treatment plant at Bivalve and work carried on there. The principles recommended for application in any closed system plan for Maurice River are outlined.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 743, 859–866, fig. 1).—The contributions presented (E. S. R., 71, p. 666) are as follows: Springtail or Thysanuran [*Compodea fragilis* Mein.] Injury, by A. G. Ruggles (p. 743); *Microbracon cushmani* Mues. Attacking *Desmia funeralis* Hbn. in the San Joaquin Valley, California, by H. C. Donohoe and D. F. Barnes (p. 859); Hydrogenated Naphthalene Against Clothes Moths, by W. Colman (p. 860); Stimulation of Fig Insects [*Carpophilus hemipterus* L. and *Ephestia figulilella* Greg.] by Certain Fumigants, by D. F. Barnes and C. K. Fisher (p. 860); Notes on a Fungus [Probably *Empusa sphaerosperma*] Attacking Onion Thrips, by A. I. Bourne and F. R. Shaw (pp. 860, 861); The Secretion of the Colleterial Glands in the Parasitic Chalcids, by S. E. Flanders

(pp. 861, 862), contributed from the California Citrus Experiment Station; Fish Meal as a Food for Clothes Moths—Supplementary Note, by G. H. Griswold (p. 862); Solvents for Cryolite, by R. H. Carter (p. 863); Progress Report Regarding the Introduction in Oregon of *Digonichaeta setipennis* Fall., a Tachinid Parasite of the European Earwig, by R. E. Dimick and D. C. Mote (pp. 863-865) (E. S. R., 66, p. 455); and Scouting for Elm Scolytids [*Scolytus scolytus* Fab. and *S. multistriatus* Marsh.], by J. N. Knull (pp. 865, 866).

[Contributions by the U. S. Department of Agriculture relating to economic insects and their control] (*U. S. Dept. Agr. Yearbook 1934*, pp. 160, 161, 199-203, 220-222, 282-285, 288-290, 332-334, figs. 6).—The results of studies of insect pests and means for their control have here been brought together in practical form as follows: Chemically Treated Bands Effectively Aid Codling-Moth Control, by E. H. Siegler and F. Munger (pp. 160, 161); Farm and Nursery Products Move Long Distances under Japanese-Beetle Certification, by L. H. Worthley (pp. 199-203); Fly Trapping Aids in Combating Screwworms of Livestock, by F. C. Bishopp (pp. 220-222); Pink-Bollworm Outbreak Fought by Destroying Wild Cotton in Florida, by R. E. McDonald (pp. 282-285); Plant Shipments Freed from Diseases and Pests by New Methods, by L. A. Hawkins (pp. 288-290); and Spraying Wild Host Plants in California Reduces Beet Leaf-Hopper Injury, by W. C. Cook (pp. 332-334).

[Report of work in economic entomology at the Idaho Station] (*Idaho Sta. Bul. 205 (1934)*, pp. 40-48, figs. 5).—The work of the year with economic insects here considered included that with the pea weevil and its survival out of doors under varying conditions, the beet leaf hopper, Colorado potato beetle, elm leaf beetle, blossom drop in alfalfa seed fields due to the pale legume bug (*Lygus elisus* Van Duzee) and the legume bug (*L. hesperus* Knight), populations of legume insects, parasites of legume bugs, a new rust mite pest of prunes in Idaho, San Jose scale control with oil emulsion which excelled lime-sulfur, a combination spray for Mineola moth and San Jose scale on prunes, and codling moth control v. arsenical and lead residue on the fruit, together with a graph showing a record of codling moths captured in bait traps for four different years at Parma, Idaho.

[Report of work with economic insects and their control in Kentucky] (*Kentucky Sta. Rpt. 1933*, pt. 1, pp. 26, 27, 30, 31, 41-44).—The work of the year, briefly referred to (E. S. R., 70, p. 206), includes that with the corn ear worm, clover root curculio, codling moth, leaf hoppers on clover, alfalfa, and grape, and spray tests with oils, adhesives, and other materials.

[Work in economic entomology at the New Jersey Stations], T. J. HEADLEE (*New Jersey Stas. Bien. Rpt. 1932-33*, pp. 36-41).—The work with economic insects here briefly reported upon includes that under the mosquito project (including a new mosquito larvicide) and investigations on the effect of light and radio waves on insects, the oriental peach moth, codling moth, and leopard moth, insecticides, the pepper maggot and corn ear worm, insects infesting ornamental plants, and the honeybee.

[Contributions on economic insects and their control in New Jersey] (*New Jersey Stas. Circs. 320 (1934)*, pp. 2; 321, pp. 4; 323, pp. 4; 324, pp. 4; 325, pp. 2; 326, pp. 4; 328, pp. 4; 329, pp. 4).—These brief practical accounts relate, respectively, to Blueberry Stem Borer, by C. S. Beckwith; Cranberry Fireworms, by Beckwith; The Eastern Tent Caterpillar (*Malacosoma americana* Fabr.), by C. C. Hamilton; The European Pine Shoot Moth (*Rhyacionia buoliana* Schiff), by Hamilton; The Apple Maggot (*Rhagoletis pomonella* Walsh), by B. F. Driggers; Hydrocyanic Acid Gas Fumigation, by T. J. Headlee; The European House Cricket (*Gryllus domesticus*), by Headlee; and Cat and Dog Fleas, by Headlee.

Insect survey work in North Carolina, R. W. LEIBY (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 735-739).—This brief account of the insect survey work in North Carolina includes a table with the faunal statistics of the State.

Insects and a mite of potential economic importance found on wild cotton in Florida, C. F. RAINWATER (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 756-761).—Four insects and a mite, found to be of significance on wild cotton in Florida, here noted in the order of their importance, are the wild cotton borer (*Rhodoneura terminalis* Walker), the flower-bud maggot (*Contarinia gossypii* Felt), the cotton blister mite, a cotton leaf miner (*Nepticula gossypii* Forbes and Leonard), and *Anomis impasta* Guenée.

Insects of stored rice in Louisiana and their control, C. L. STRACENER (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 767-771).—Examination by the Louisiana Experiment Station of samples of rice in the 1931 crop collected early in September 1932 from warehouses over the entire rice area of the State, some 85 samples in all, including samples of different varieties, developed the fact that considerable loss is sustained by the growers. The average infestation of the 1931 crop, when carried through August, was slightly above 20 percent, with a total loss in weight of 16 percent. The total loss in the 1932 crop was 14 percent, the lower rate being due to the more severe winter of 1932-33. Over 95 percent of this loss was due to three species which, in order of their importance, are the lesser grain borer (*Rhizopertha dominica* Fab.), the Angoumois grain moth, and the rice weevil. Other species found in rice which are responsible for some loss in cleaned rice are the cadelle, the confused flour beetle, the flat grain beetle, the square-necked grain beetle, and the saw-toothed grain beetle, with a few other species rarely found.

A study made of samples stored in jars during the season indicated that the real spread of infestation takes place in the warehouses. "Only 8 percent of samples collected from the fields developed any infestation, while 17.5 percent of the samples collected from the warehouses in late January, 47.7 percent collected in early April, and 97.4 percent collected the middle of June developed insects. . . . The study shows further that the average infestation for the middle of June was 3.5 percent of all samples collected, while that for September was slightly above 16 percent. It was noted that the September infestation of samples collected in June was but 12 percent, the same for samples collected in April 9 percent, and those collected in January 5.5 percent."

Carbon disulfide, used at the rate of 5.5 lb. per 1,000 cu. ft. when mixed in its gaseous state with 4.5 times its volume of carbon dioxide, was found to be noninflammable and thoroughly toxic to the cadelle in both its larval and adult stages. In battery jar tests, 100 percent kill of the cadelle and confused flour beetle in 24 hr. was obtained when applied at as low a rate as 1.4 lb. to 1,000 cu. ft.

[Work with cranberry and blueberry insects at the New Jersey Stations], C. S. BECKWITH and C. A. DOEHLERT (*New Jersey Stas. Bien. Rpt. 1932-33*, pp. 25, 26, 27, 28).—Work reported upon includes that with the blunt-nosed leaf hopper (*Euscelis striatulus* Fall.), which is the vector of cranberry false blossom disease, fireworm control, the Japanese beetle on cranberries and on blueberries, the cranberry weevil on blueberries, stem gall due to *Hemadas nubilipennis*, and the stem borer.

Derris insecticides (*New Jersey Stas. Bul. 576* (1934), pp. 23).—Following a historical discussion presented in connection with a list of 32 references to the literature, this contribution deals with the subject in two parts:

I. *Toxicity of various extracts of derris root to sucking and chewing insects*, J. M. Ginsburg, J. B. Schmitt, and P. Granett.—In the course of the

work reported upon, the details of which are presented in 8 tables, derris root was extracted with acetone, alcohol, and water by two different processes. "One process consisted of continuous distillation in Soxhlet apparatus for 10 hr. The other process consisted of making a suspension of the ground root in the solvent and allowing it to stand for 48 hr. The mixture was filtered through cheesecloth and washed several times with clear solvent. Secondary extracts were obtained by re-extracting the root residues from one solvent with another solvent. The primary and secondary extracts were tested on apple aphids, silk moth caterpillars, and mosquito larvae." The results obtained led to the following conclusions:

"Water-soluble organic solvents such as acetone and alcohol are able to extract practically all of the water-soluble and water-insoluble ingredients of derris root toxic to sucking insects. Either continuous distillation or soaking with subsequent filtration and washing extracts all the active principles which act as contact poison when acetone or alcohol is used. Water does not extract all the toxic principles of derris root. At low dilutions the water extracts compared well in toxicity with acetone and alcohol extracts but proved inferior to them in high dilutions. Water extracts rapidly deteriorate on standing, with resultant loss of toxicity. Alcohol extracts slowly lose toxicity upon standing. Acetone extracts do not show any appreciable changes in toxicity upon standing. The toxicity of derris extract varies with different species of insect. Derris extracts were more toxic to insects than were solutions of pure rotenone, although the concentration of rotenone was practically the same in each case. Rotenone alone is not an adequate criterion to evaluate the toxicity of derris root to insects."

II. *Insecticidal properties of extracted derris root residue*, J. M. Ginsburg and P. Granett.—Toxicity tests with derris root powder and its exhausted residues, after extraction with acetone and with acetone followed by water, carried out against silkworm larvae, cabbage worms, and apple aphid are reported. These materials were applied in the form of coarsely and finely ground dusts. The results led to the conclusion that derris root is very toxic to many sucking and chewing insects. "Against aphids, the toxicity was greater when the dust was applied on wet foliage than on dry foliage. Residues from derris root extracted with acetone possess practically no toxicity to aphids, but are both toxic and repellent to caterpillars. Residue from derris root extracted first with acetone and then with water does not seem to possess direct toxicity to caterpillars but acts as a deterrent, preventing them from feeding on the dusted foliage."

Oil retention, oil-emulsifier ratio, and oil-water ratio as affecting the insecticidal efficiency of emulsions, A. W. CRESSMAN and L. D. DAWSEY (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 1-19, figs. 9).—In spraying experiments conducted in both laboratory and field to determine the insecticidal efficiency of a number of emulsions made with mineral oil the camphor scale was used as the test insect. The efficiency of the insecticide was found to depend principally upon population density and oil retention. It varies inversely with the population density whether a light or heavy oil deposit is left on the tree. "Chemical measurements of the oil retained on the foliage after it had been sprayed showed a quantitative relationship between insecticidal efficiency and the amount of oil deposited per unit area of plant surface. The efficiency varied directly with the oil dosage. Oil deposit and insecticidal efficiency were found to vary inversely with the concentration of soap emulsifier in the aqueous phase of the emulsions but to vary directly with the concentration of oil in the emulsions. The quantity of oil deposited on camphor leaves

by sprays can be increased, within limits, by using less emulsifier, or by increasing the oil concentration.

"Sprays which, when applied to camphor foliage, left oil deposits of from 1.63×10^{-5} to 10.4×10^{-5} g of oil per square centimeter of leaf surface gave controls of from 10 to 99 percent, respectively, depending upon the age, the brood of the scales, and the population density. The rate of increase in kill per unit increase of oil residue was more rapid with smaller quantities of oil than with larger. Heavily infested plant areas showed lower mortality than sparsely populated twigs for equivalent quantities of oil.

"Susceptibility to the oil in the adult stage was found to decrease as the age of the scale increased."

A list of 14 references to the literature is included.

A method of studying comparative oil deposits of proprietary oil emulsions, A. D. BORDEN and G. S. HENSILL (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 834-841, fig. 1).—Reporting results of their studies, the authors point out that oil emulsions have been recommended for use without regard to the oil-depositing properties and that some manufacturers offer two or more brands of emulsions which have practically the same stock oil and similar oil-depositing properties. This practice is considered confusing to the user and impractical, since it would be better if only one emulsion of each type were offered. Further, several brands which are so low in oil-depositing properties that their value as an insecticide is questionable are offered to orchardists. Emulsions of low depositing properties cost within a few cents as much as those of high deposits and yet are sold in competition with the better grades for similar purposes.

The studies here reported have led to the preparation of a table that shows how the insecticidal value of any emulsion can be correlated with its oil-depositing property.

A device for regulating the quantity of liquid used in spraying, O. I. SNAPP and J. R. THOMSON (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 832-834, figs. 3).—The authors here describe and illustrate an apparatus or device which will spray out under pressure accurate quantities of the liquids used in spraying.

The relative efficiency of some fumigants against the rice weevil and the confused flour beetle, H. H. SHEPARD and D. L. LINDGREN (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 842-845, fig. 1).—The authors' studies at the Minnesota Experiment Station here reported show carbon disulfide to be more toxic to the rice weevil than are ethylene and propylene dichlorides. With the confused flour beetle, however, the relationship is reversed, carbon disulfide being less toxic.

Insectary notes on the field cricket, J. W. FOLSOM (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 744, 745).—Notes on the field cricket (*Gryllus assimilis* Fab. var. *pennsylvanicus* Burm.), which feeds on cotton plants every year, based upon observations at Tallulah, La., extending over 4 successive years, are here presented.

A preliminary study of thrips on seedling cotton, with special reference to the population, migration, and injury, J. C. GAINES (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 740-743, figs. 3).—This contribution from the Texas Experiment Station reports work conducted in the Brazos River bottoms and upland in the vicinity of College Station with a view to determining the population, migration, and injury that is caused by thrips on seedling cotton. The flower thrips and *Sericothrips variabilis* (Beach) were the two most common species, while the tobacco thrips was observed in small numbers in the two

cotton fields under observation. A table is given showing the population of thrips and flea hopper nymphs in an upland and a bottom land cotton field.

Paper barriers for chinch bug control, H. M. HARRIS and G. C. DECKER (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 854-857).—In work at the Iowa Experiment Station the authors have found the more important advantages of the paper barrier over previously used chinch bug fences to be as follows:

"The effectiveness of the barrier is entirely independent of the character of the soil. Bugs that are massed along the barrier are not swept over by sudden gusts of wind. There is not the difficulty of oil glazing over or of dust, clods, straws, etc., settling on it and forming bridges over which the migrating hordes could pass. The amount of time and labor required to keep the barrier working effectively is considerably less than in the case of other barriers. The total amount of chemical necessary for a barrier of a given length is proportionately much smaller than that necessary for a creosote furrow barrier. The paper barrier introduces the possibility of using more expensive chemicals which may have greater repellent values and more lasting qualities. In preliminary tests pine tar, pine oil, beta-naphthol, wood creosote, and refined creosote have shown considerable promise as materials which might economically be used in connection with this type of barrier. The development of chemically treated chinch bug papers which would not need retreatment does not seem outside the realm of practicability and is already being investigated by several commercial firms."

The woolly aphid in Tennessee, S. MARCOVITCH (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 779-784).—In studies of the woolly apple aphid at the Tennessee Experiment Station, a constant temperature of about 68° F. was found to be near the optimum for its growth and development. At a constant temperature of 100° and 40 percent relative humidity, the young were found to survive only 40 min. During hot droughty summers when the soil temperature often reaches 100° or over the root forms seem to disappear almost entirely. Among the different insecticides used, "paradichlorobenzene, paranitrochlorobenzene, nicotine, pine tar creosote, and carbon disulfide emulsion, the last seems to be the most promising and practical only in the newly set orchard."

Observations on the summer activities of Aphis maidis Fitch, H. R. BRYSON (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 827-832).—Contributing from the Kansas Experiment Station, the author reports upon a study commenced in the summer of 1931 and continued throughout the season of 1932. Observations of the summer behavior of the corn leaf aphid indicated that it is primarily a pest of sorghums, and remained on the sorghums throughout the summer when immature plants were present in the fields. It was found on corn for only a brief period prior to the appearance of the tassels. "The shift in the population of the aphids from the sorghums to the adjoining corn and back to the sorghums followed the production of large numbers of winged forms. The peak in the numbers of these forms occurred July 1 and August 1 in the investigations conducted in 1932. The aphids showed a preference for dent corn over sweet corn and for sorghums over corn when the entire season was considered as a whole."

A preliminary report on the use of creosote oil (wood oil) to control San Jose scale and peach leaf curl, W. W. STANLEY, S. MARCOVITCH, and J. O. ANDES (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 785-788).—In experiments conducted at the Tennessee Experiment Station in 1931 and 1932, creosote oil as a summer application was found to be very toxic to San Jose scale and peach leaf curl, the control obtained being in direct proportion to the amount of creosote oil in the spray. Mixtures of creosote oil and oil emulsion were much more toxic than when the materials were used separately.

Further experiments in the control of the peach borer on nursery stock and orchard trees. O. I. SNAPP and J. R. THOMSON (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 771-779).—The results of experiments (E. S. R., 68, p. 220) conducted in 1932 and 1933 in which emulsions of crude cottonseed oil and of mineral oil impregnated with paradichlorobenzene to control the peach borer are presented in tabular form. The results indicate that an emulsion of crude cottonseed oil "impregnated with paradichlorobenze, applied as spray around the base of the tree and on the lower part of the trunk, is effective against the peach borer in nursery stock and orchard trees and causes no tree injury at strengths sufficient to kill the borers. Nursery stock should receive $\frac{1}{2}$ pt. of the emulsion carrying $\frac{1}{8}$ oz. of paradichlorobenzene to each tree, and orchard trees should receive $\frac{1}{2}$ pt. of the emulsion carrying $\frac{1}{8}$ oz. of paradichlorobenzene to each 1- and 2-year-old tree, $\frac{1}{4}$ oz. of paradichlorobenzene to each 3-year-old tree, and $\frac{1}{2}$ oz. of paradichlorobenzene to each 4- and 5-year-old tree. Peach trees 6 yr. of age and older should receive 1 pt. of the emulsion carrying $\frac{3}{4}$ oz. of paradichlorobenzene to each tree. These dosages will kill peach borer eggs as well as the larvae. The application should be made at the end of the oviposition period of the moth, and the spray should be covered with several shovelfuls of soil to prevent surface loss. This method is inexpensive, as the materials for spraying 1,000 nursery trees will cost only about \$2. This method appears effective and safe for the control of the peach borer in nursery stock and in 1-, 2-, and 3-year-old orchard trees under conditions in the South." The spray has been found effective in some cases where there were borers in the crotch of the tree and in the trunk as high as 8 in. above the ground.

The plum tree borer (*Synanthedon pictipes* G. & R.): Its distribution, life history, economic importance, and control. G. I. GILBERTSON (*South Dakota Sta. Bul.* 288 (1934), pp. 22, figs. 10).—This is a summary of studies conducted at the station since 1926 (E. S. R., 58, p. 755; 61, p. 53; 64, p. 653).

This borer, officially known as the lesser peach borer, is a native American insect quite widely distributed over South Dakota, where it attacks wild plums, wild cherries, and the cultivated varieties of plums and cherries. It attacks the trunk and larger branches and may be found beneath the surface bark feeding upon the cambium and living tissues. Neglected plantings are most frequently attacked. At times the borer may kill the bark tissue on one side of the tree, killing the branches on that side. Very often the borer may girdle the trunk, causing the death of the tree.

The borer has but a single generation a year in the latitude of South Dakota. The winter is passed in the partially grown larval or borer stage, feeding being resumed in the spring and the borer completing its growth on or about May 1. "It makes a cocoon and within it changes to a pupa. Within 20 to 30 days transformation is complete and the pupa wriggles to the outer bark through a gallery made by the borer. It pushes its body through the outer bark layer until a half or two-thirds of its body length projects into the open air. The moth then emerges. Within an hour the sexes may assemble and mate. The moths have been found on June 1, more abundant in mid-June, and in a few numbers in early July. Egg laying takes place a short time after mating. The small reddish-brown eggs are laid usually in crotches, crevices, beneath loose-curved bark, and around wound margins. The eggs hatch in from 8 to 10 days. The larva works its way to the cambium where it feeds and grows until fall. It then constructs an overwintering cell and hibernates until spring.

"While the plum tree borer is subjected to the attacks of parasites and predators, it still maintains itself as one of our most serious plum tree insects.

It is therefore necessary to resort in all cases to cultural and chemical controls. Cultural controls invoke all phases of orchard management which maintains the vigor and health of the trees. Therefore, if a tree is maintained in a healthy, vigorous condition, it is not so subject to borer infestation. Chemical control consists of toxic gases which enter the burrow and kill the larva. The gas used is the volatile vapor from paradichlorobenzene, often called P. D. B."

A list is given of 15 references to the literature.

Special sugarcane investigations.—Progress report, department of entomology, W. E. HINDS and B. A. OSTERBERGER (*Sugar Bul.*, 12 (1934), No. 18, pp. 4, 5).—This further report on the progress of control work with the sugarcane borer supplements the information previously noted (E. S. R., 71, p. 678).

Special sugarcane investigations.—Progress report, department of entomology, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Sugar Bul.*, 12 (1934), No. 20, pp. 5, 6).—This further contribution reports on the status of sugarcane borer parasitism by *Trichogramma*, including the results obtained in plantation test areas.

The influence of soil moisture upon survival of the pink bollworm, A. J. CHAPMAN and H. S. CAVITT (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 820-827, figs. 3).—This is a report of studies conducted at Presidio, Tex., by the U. S. D. A. Bureau of Entomology cooperating with the Texas Experiment Station. The contribution records observations on the effect of different more or less constant soil moisture percentages in sandy loam and clay adobe soils on the survival of the pink bollworm and upon the rate of emergence of long-cycle moths. The experiments were begun in December 1929 and concluded in August 1932, thus covering a period of nearly three years.

A new dipping apparatus for treating corrugated paper bands for use in control of the codling moth, F. MUNGER, M. P. JONES, and E. H. SIEGLER (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 817-820, figs. 3).—A description is given of a new dipping apparatus found to be thoroughly satisfactory in the treatment of corrugated paper bands for use in combating the codling moth.

Pupal parasites of the oriental fruit moth in South Carolina.—A preliminary report, W. C. NETTLES (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 814-817).—This contribution from the South Carolina Experiment Station supplements information presented in Bulletin 278 previously noted (E. S. R., 66, p. 53). *Haltichella longicornis* Ashm. and *Brachymeria hammari* Cwfd. were the source of approximately three-fifths of the total parasitism of oriental fruit moth pupae.

Bordeaux-oil sprays as repellents to the lesser bulb fly, F. S. BLANTON and F. J. SPEUJT (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 845-848).—The authors' studies have led to the conclusion that Bordeaux oil mixtures in 2 and 4 percent dilutions applied to narcissus bulbs have no repellent effect on the lesser bulb fly. "In the stronger dilution the oil is injurious to the foliage and possibly also to the bulbs. Fly infestation and basal-rot infection may be increased as a result of this injury. Straight 4-4-50 Bordeaux mixture not only keeps the plants in a healthy growing condition that reduces the chance of the larvae entering the bulb, but also to a certain extent seems to stimulate and invigorate growth. It is not known whether the enormous increase in yield over the untreated plot when straight Bordeaux mixture is used is due to the control of foliage diseases or to the absorption of a small amount of the copper by the foliage which may serve as a stimulant to the bulb or both."

Testing contact insecticides on the Japanese beetle, and results with some sodium and potassium soaps, W. E. FLEMING and F. E. BAKER (*Jour.*

Agr. Res. [U. S.], 49 (1934), No. 1, pp. 29-38).—The authors found that the effectiveness of a material as a contact spray against the Japanese beetle can be determined most accurately by wetting groups of beetles uniformly by submersion for 120 sec. in different concentrations of the material and keeping the beetles at a temperature of 80° F. and a relative humidity of 96 percent for 24 hr. The mortality is then compared with that resulting when a standard insecticide is used.

Sodium soaps were found to be more effective than potassium soaps; soaps containing excess alkali were more effective than neutral soaps or soaps containing free acid. The effectiveness of neutral potassium soaps of the saturated fatty acids increased with the molecular weight. Potassium soaps of soybean, cottonseed, and raw linseed oils were slightly more effective than neutral potassium oleate, which was used as a standard; boiled linseed oil soap was equivalent to the standard; and soaps of blown castor oil, peanut oil, and coconut oil were somewhat less effective than the standard.

The effectiveness of stomach-poison insecticides on the Japanese beetle, W. E. FLEMING and F. E. BAKER (*Jour. Agr. Res. [U. S.], 49 (1934), No. 1, pp. 39-44*).—The effectiveness of stomach-poison insecticides on the Japanese beetle was determined by the authors under controlled conditions of temperature, relative humidity, and light, their relative value being expressed as the coefficient of acid lead arsenate, which was used as a standard.

The addition of lead oleate, fish oil, or flour to the lead arsenate increased the adhesiveness of the material. Mixtures of lead arsenate with flour or with fish oil were more effective, even after the foliage was washed with water, than freshly applied lead arsenate without a sticker. The effectiveness of commercial acid lead arsenate increased progressively with the increase in concentration up to 8 lb. to 100 gal. of spray; higher concentrations gave no further increase in effectiveness.

Nicotine sulfate and anabasine sulfate absorbed on bentonite, and 2-phenylbenzothiazole, when applied as dusts had little insecticidal value, rotenone was about three-fourths as effective, and dihydrototenone was about equal to lead arsenate. Barium arsenate, calcium arsenate, and cuprous cyanide were inferior to lead arsenate. Fifty pounds of derris (containing 4 percent rotenone) per 100 gal. of water was equivalent to 8 lb. of lead arsenate.

Protecting plants in the home yard from injury by the Japanese beetle, W. E. FLEMING, F. W. METZGER, and M. R. OSBURN (*U. S. Dept. Agr. Circ. 326 (1934), pp. 13, figs. 8*).—This is a practical summary of the results of investigational work regarding the protection of plants against the Japanese beetle.

Protection of orchard and shade trees and ornamental shrubs from injury by the Japanese beetle, W. E. FLEMING, F. W. METZGER, and M. R. OSBURN (*U. S. Dept. Agr. Circ. 317 (1934), pp. 8, figs. 6*).—This account supersedes that presented in Circular 237, previously noted (E. S. R., 68, p. 72).

Traps for the Japanese beetle and how to use them, F. W. METZGER (*U. S. Dept. Agr., Misc. Pub. 201 (1934), pp. 11, figs. 4*).—This is a revision of and supersedes Miscellaneous Publication 147, previously noted (E. S. R., 68, p. 72).

Experiments with suction light traps for combating the cigarette beetle, W. D. REED, A. W. MORRILL, JR., and E. M. LIVINGSTONE (*Jour. Econ. Ent., 27 (1934), No. 4, pp. 796-801, figs. 2*).—The authors report upon work with a suction light trap composed of a sheet metal cylinder in which is fastened a 1/20-hp. motor with fan blades attached and designed to operate suspended from the ceiling. The results of trap experiments conducted from August to November 1932, inclusive, in both open and closed tobacco storage warehouses, are pre-

sented in tabular form. It is concluded that the large catches thus obtained will serve materially to reduce the population of cigarette beetles in tobacco warehouses, although further experimentation is considered necessary before the trap can be recommended as a control measure. It is pointed out that "fumigation is more effective than trapping when cured tobacco is stored in fumigable warehouses, but much tobacco is stored, during the aging process, in open storage warehouses which cannot be fumigated. It is in this type of tobacco warehouse that trapping will be most useful in combating the cigarette beetle."

The clover root curculio (*Sitona hispidula* Fab.) in Kansas, G. E. MARSHALL and D. A. WILBUR (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 807-814, figs. 2).—An account is given of the clover root curculio, first found at the Kansas Experiment Station in 1923 in large numbers on lawns having a white clover mixture. Although first found largely in white clover, only an occasional specimen occurring in alfalfa, it has now become a serious enemy of the alfalfa crop. The damage done to alfalfa, while not ordinarily conspicuous at any one time, extends over the entire growing season. Fungus and bacterial diseases, insect parasites, and predators of the clover root curculio have been comparatively scarce in Kansas up to the present time.

The development of the boll weevil on plants other than cotton, R. C. GAINES (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 745-748, fig. 1).—This paper summarizes studies conducted in 1932 and 1933 in continuation of those in 1932 previously noted (*E. S. R.*, 70, p. 215). "Three bollweevils developed in, and emerged from, buds of althea (*Hibiscus syriacus*) from a caged plant in 1932, and 11 bollweevils emerged from althea buds from a caged plant in 1933. In the latter year 7 bollweevils developed in, and emerged from, althea buds that were collected from plants growing in a bollweevil infested cotton field. No bollweevils developed, under either cage or natural conditions, in the forms of *H. militaris*, *H. lasiocarpus*, or okra (*H. esculentus*). Bollweevils were observed, however, in the blooms of althea, *H. militaris*, and *H. lasiocarpus*, and 1 bollweevil was observed feeding on an althea bud. In the cages, bollweevils were observed feeding on the buds, blooms, and seed pods of *H. militaris*, on the blooms and young seed pods of *H. lasiocarpus*, and on the blooms of okra."

Field-plat tests for boll weevil control at Tallulah, La., during 1933, M. T. YOUNG (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 749-756).—The results of work conducted in 1933 at the field laboratory at Tallulah, La., in which applications of calcium arsenate were compared with other insecticides on three plats each, are presented, the details being given in three tables. The nine plats that were treated with a standard calcium arsenate by the standard method gave an average increase of 419 lb. of seed cotton per acre, or 45.4 percent average increase over the untreated check plats. These gains ranged from 187 to 617 lb. of seed cotton per acre, or from 28.6 to 72 percent over the respective check plats.

The square-infestation records show that sodium fluosilicate, sodium fluoaluminate, and barium fluosilicate were not so effective as calcium arsenate when applied at the same rate per acre.

"The wet-mixed and dry-mixed dusts of calcium arsenate and paris green of both brands A and B were equally or more effective in controlling the weevil infestation than the calcium arsenate, and in some cases the yields were greater than those on plats treated with calcium arsenate. The comparative yields in the plats treated with the wet-mixed and dry-mixed dusts indicate that there is little difference in their effectiveness. Burning of the cotton foliage was produced by many of the applications of both types of mixtures of brands A

and B. The two mixtures of copper arsenite and calcium arsenate tested gave results about equal to those of the mixtures of paris green and calcium arsenate. The hydrated lime and calcium arsenate mixture gave very good weevil control, based on the square infestation records, but the yields were not so great as on the plat treated with calcium arsenate alone. Although there was considerable variation in the increased yields of the three cultivator-dusted plats, the results when averaged are rather promising."

Relationship between early varieties of cotton and boll weevil injury, D. ISELY (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 762-766).—This contribution reports upon studies of the importance of the difference between early and later varieties of cotton as regards bollweevil injury conducted by the Arkansas Experiment Station. In 1923, a year of severe weevil injury, the extra early varieties yielded 69.25 percent more seed cotton than the late varieties and slightly more than the medium early varieties. In 1924, in which year the invasion occurred later, one of the experimental series escaping weevil injury altogether, the early varieties produced only 18.61 percent more seed cotton than the late varieties and slightly less than the medium early varieties. Thus the difference between the extra early varieties and the late varieties was 50.64 percent greater during the year of severe weevil injury than during the year of light injury.

The results of control field plat experiments conducted in 1926 and repeated at the station farm in 1927 and in 1929 at Hope, Ark., are presented in tabular form. While the conditions in each set of these experiments were different, the results were the same in that the earliest varieties always suffered the least weevil injury. The results are considered to justify the recommendation that only the earliest varieties be planted in situations where a regular annual hazard from overwintered weevils occurs. It is pointed out that such situations probably include less than 5 percent of the total cotton acreage of the State.

"Where weevils do not regularly invade a field until midsummer, the medium early varieties may be grown to advantage if they are desirable for other reasons. On the light sandy uplands of southwestern Arkansas, where sudden checking of growth by drought frequently occurs, both weevil injury and the plant growth tends to be small. Under such conditions the factor of earliness can probably be ignored in the selection of a variety. The degree of emphasis which it should receive in the greater part of the State depends on local conditions."

It is concluded that dusting to control the weevil is less necessary or less advantageous on early than on later varieties. In dusting experiments carried on by the department of entomology, where weevil control has been the only purpose, the gains from dusting have averaged approximately 120 percent. "An extra early variety, particularly if it germinates well and is relatively hardy to cold in the seedling stage, may have further use in weevil control as a trap crop in concentrating infestations of overwintered weevils. A trap crop is of value only in situations where early infestations of overwintered weevils are known to occur annually."

Changes in total nitrogen content during the life of the imago of the worker honeybee, M. H. HAYDAK (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 21-28, fig. 1).—The studies report upon separate determinations made of the total nitrogen content of the heads, thoraces, and abdomens of bees, and of whole bees made in successive days after emergence.

The greatest increase in the nitrogen content occurred during the first 5 days of adult life. The average increase in the nitrogen content of bees 5 days old over that of newly emerged bees amounted to 92.6 percent in the head, 76.0 in the abdomen, 37.5 in the thorax, and 64.1 in whole bees.

The average nitrogen content of all parts of the body of bees older than 5 days was less than that of bees 5 days old, except in the case of the thoraces which increased after the bees had reached the 20th day. The total nitrogen content (found by computation) of the alimentary tracts corresponded closely to the quantity of pollen in the recta. The largest content of nitrogen in the alimentary tracts was found in bees 8 days old. This represented an increase of 300 percent over that of newly emerged bees. Afterwards the nitrogen content of the alimentary tracts gradually decreased, until at the age of 31 days it reached almost the level of that of newly emerged bees.

Selection of honeybee stock is important to beekeeper and orchardist, W. J. NOLAN (*U. S. Dept. Agr. Yearbook 1934*, pp. 314-316).—The author emphasizes the importance of an exact knowledge of the races and strains of races of the honeybee as to the honey-gathering capacity and the selection of the best race based upon such information. Attention is called to the importance of the honeybee as a pollinator, particularly of fruit and vegetables, and the possibility that the one best suited for honey production may not be the one best for pollen collecting.

A manual of bee husbandry, E. G. CARR (*New Jersey Stat. Circ. 317 (1934)*, pp. 88, figs. 47).—A reprint and revision by Carr and R. S. Filmer of Bulletin 463 (E. S. R., 60, p. 66).

Sugarcane borer control by Trichogramma in Louisiana, 1933, W. E. HINDS, B. A. OSTERBERGER, and A. L. DUGAS (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 788-795).—This contribution is based upon studies at the Louisiana Experiment Station, the details of which have been previously noted (E. S. R., 71, p. 678).

A hymenopterous parasite (Cephalonomia gallicola Ashm.) new to the cigarette beetle (Lasioderma serricorne Fab.), C. W. KEARNS (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 801-806, fig. 1).—A preliminary account is given of the biology of a new parasite of the cigarette beetle first found by the author at Urbana, Ill., in October 1933 in a culture of beetles that originally came from Richmond, Va. The studies show that while this parasite, first described by Ashmead in 1887, is much slower than other hymenopterous parasites such as *Trichogramma* and *Habrobracon* in its beneficial effect, this is considerably offset in that it is hardier and will reproduce over a longer period. It is thought that *C. quadridentata* Van Emden 1931 may prove to be identical with *C. gallicola*. "*C. gallicola* appears to have a distinct advantage over the species of hymenopterous parasites normally found in tobacco storages, such as *Aplastomorpha vandinei* Tucker and *A. pratti* Cwfd., which are winged and strongly attracted to light traps, where they die with the trapped hosts. Inasmuch as there are a great many open-type storages in the tobacco industry which cannot possibly be fumigated, it seems that this parasite could be introduced and used along with light traps as one of the few possible means of reducing an infestation under such conditions."

The biology and distribution of ants in Hawaiian pineapple fields, J. S. PHILLIPS ([*Hawaii.*] *Pineapple Producers' Sta. Bul. 15 (1934)*, pp. III+57, figs. 4).—A brief discussion of the classification of ants and a key to the species that occur in the Hawaiian Islands are first presented. Brief general remarks on the species are followed by discussions of the more important forms, particular attention being given to *Pheidole megacephala* (Fab.) and the fire ant. Extended accounts are then given of the climatic factors affecting ant distribution in Hawaii (pp. 24-42), some effects of ants on the environment (pp. 42-50), and some effects of the environment on ants (pp. 50-53).

P. megacephala, the dominant species in the islands, is said to be gradually driving the other species out of all except the driest areas. Its dominance is

due to superior mobility, aggressiveness, persistence, and coordinate fighting tactics. Observations have shown it to have a life cycle of about 2 mo., and that under laboratory conditions the winter cycle averages 2 weeks longer than the summer cycle. The fire ant is the second most important species in the pineapple areas on Oahu, but it does not occur in those of the other islands. Its nests extend downward to a depth of 5 ft. or more and contain a great number of individuals, the life cycle averaging about 2 mo.

A list of 61 references to the literature and a short glossary of terms are included.

Acarina as possible vectors of the Dutch elm disease, A. P. JACOT (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 858, 859).—Attention is called to the possible importance of the oribatid mites that feed upon fungi, algae, lichens, and other vegetable tissues in the distribution of the Dutch elm disease fungus *Ceratostomella (Graphium) ulmi*.

ANIMAL PRODUCTION

Analysis of the comparative feeding trial by the variance and covariance methods, E. W. CRAMPTON (*Jour. Nutrition*, 7 (1934), No. 3, pp. 305–320, fig. 1).—In this article from Macdonald College, Canada, the author discusses two statistical methods of freeing the live weight gains of animals in feeding trials from the effect of varying feed consumption. By the use of one or the other of these methods the variation in gains, both between treatments and between replicates, due to differences in feed intake is eliminated.

The use of the method of partial regression in the analysis of comparative feeding trial data, Part I, E. W. CRAMPTON and J. W. HOPKINS (*Jour. Nutrition*, 8 (1934), No. 1, pp. 113–123).—Continuing the above studies on the analysis of data obtained in feeding trials, this paper reports a study of relationships which exist between the initial weights, feed consumption, and live weight gains of swine. The material used consisted of results of a fairly extensive series of feeding tests in which the rations and treatment of pigs were comparable.

All groups showed highly significant relationships between gain and feed consumption, the increase in gain due to each additional unit of feed consumed decreasing with advancing age of the animal. The gain was also dependent upon the initial weight of the pig. The gain-feed ratio did not efficiently correct the observed final weights for variations in initial weight and feed intake. This factor may be satisfactorily corrected by means of regression coefficients. The procedure can be applied to comparative feeding tests in which the experimental lots are treated differently.

Growth and development with special reference to domestic animals, XXXII, XXXIII (*Missouri Sta. Res. Buls.* 208 (1934), pp. 16, figs. 2; 209 (1934), pp. 32, figs. 10).—This series of studies is continued (E. S. R., 70, p. 70).

XXXII. The energy cost of horizontal walking in cattle and horses of various ages and body weights, W. C. Hall and S. Brody.—Comparative data for heat production and cardiorespiratory activities during standing and horizontal walking of seven cattle ranging in weight from 384 to 930 kg and of seven horses ranging in weight from 91 to 688 kg are presented. Walking periods of 1.2, 2.2, and 3.1 miles per hour were used. Data on a few humans were included for comparative purposes.

The analyses of the data were summarized as follows: “(1) The percentage heat increment of walking over standing increases in a roughly linear manner with speed. For humans the relation of the percentage heat increment of

walking over standing, Y , to speed, S , is $Y=74S$; which means that at 1-mile hour speed the increase of walking over standing is 74 percent; at 2-mile hour speed the increase is 148 percent; and so on. The percentage rise with increasing speed is less steep for horses. (2) The net energy expense of walking (expense above standing) per unit live weight and per unit horizontal distance is independent of speed. It is 39.7 Calories per 100 lb. live weight per horizontal mile for humans, 33 Calories for cattle, and 28.1 Calories for horses. . . . (3) The over-all energy expense of walking (including the overhead cost of maintenance) per unit line weight and per unit horizontal distance decreases with increasing speed according to the equation $Y=Ae^{-ks}+C$, in which Y is the over-all energy expense of walking for speed S , and C is the net energy expense of walking. (4) Per unit of live weight and distance walked, horses spend less energy than cattle, and cattle somewhat less than humans. . . . These differences are apparently independent of size of animals, since the differences between two small ponies were greater than between the small ponies and large horses."

XXXIII. Efficiency of work horses of different ages and body weights, R. C. Procter, S. Brody, M. M. Jones, and D. W. Chittenden.—A simple method is described for measuring the energy expenses of walking and pulling loads by horses. Extensive data are presented for the energy cost and efficiency of work on a horizontal plane of one Percheron gelding, one Percheron colt, and two Shetland ponies. Cardiorespiratory activity data for horses during standing, walking, and pulling loads are presented also.

It was found that the gross energetic efficiency of work under the above conditions increased with increasing rate of work approaching an efficiency of 25 percent as a limit. When the overhead cost of standing at rest and of walking was deducted from the total energy expense, then the resulting absolute efficiency was practically constant and was of the order of 34 percent. While the over-all efficiency of work in large and small horses was the same when doing work at rates proportional to their body weights, the greater maintenance cost of large animals when at rest resulted in a relatively greater feed cost and hence a lower net efficiency.

The detailed numerical data for energy metabolism and cardiorespiratory activities are presented, together with graphs and equations relating to the variables.

Storage of vitamin A in cattle, H. R. GULBERT and G. H. HART (*Jour. Nutrition*, 8 (1934), No. 1, pp. 25-44, fig. 1).—Continuing the study of vitamin A deficiency among range cattle at the California Experiment Station (E. S. R., 70, p. 662), the symptoms previously described as occurring under natural conditions on the range were reproduced under controlled conditions. The relation of these findings to range cattle problems in the State is discussed.

Two beef steers fed a ration of dried molasses beet pulp, rolled barley, cottonseed meal, and calcium carbonate showed clinical symptoms of vitamin A deficiency after from 225 to 240 days. These animals were in a critical condition after 282 days and were autopsied. The color reaction of Carr and Price (E. S. R., 56, p. 10) was used to follow the gradual depletion of reserves with advancing time by estimating the vitamin A potency of the liver oil of autopsied steers. This evidence indicated that carotene may be withdrawn from the adipose tissue without disturbing the deposited fat.

The expulsion of the fetus before it is viable, in the absence of infectious abortion, is described. Heifers on a restricted vitamin A diet during the gestation period produced calves that developed severe diarrhea at from 2 to 8 days of age. The milk of the dams was deficient or subnormal in vitamin A. One of the above calves developed marked night blindness, even though there

was no clinical evidence of vitamin A deficiency in the dam up to 6 mo. following parturition.

The livers of mature beef cows, maintained under favorable conditions, had approximately the same vitamin A concentration as high potency cod-liver oil. The vitamin A content of the livers of calves from well-kept cows was relatively low, but the colostrum milk was high in this factor.

Vitamin A storage in the livers of turkeys and chickens, H. R. GUILBERT and W. R. HINSHAW (*Jour. Nutrition*, 8 (1934), No. 1, pp. 45-56, fig. 1).—The livers of White Leghorn females and Bronze turkeys were examined colorimetrically (E. S. R., 56, p. 10) at the California Experiment Station in order to estimate the vitamin A storage.

A direct correlation was found between the liver storage and the level of vitamin A in the ration, the growth and mortality records, and the survival period of pen mates when placed on vitamin A-deficient rations. The chickens had a greater storage of vitamin A than the turkeys comparable in regard to maturity and feeding history. Wide variations were found among individuals from pens receiving the same feed.

Turkeys receiving 8 percent of dehydrated alfalfa leaf meal had a lower storage of vitamin A in the liver than did turkeys having access to green feed in addition to the vitamin A-carrying feeds in the ration. There was relatively little storage of vitamin A in young turkeys even when the ration contained an abundance of this vitamin. On such rations the liver storage increased rapidly as the percentage rate of growth decreased. The vitamin value of liver samples taken at the first clinical evidence of deficiency varied from a trace to 2 units per gram of liver.

The technic described in the above paper had limitations in determining the vitamin A requirements of fowls, but the simplicity of its procedure and equipment necessary make it adaptable to general use.

[Livestock studies by the U. S. Department of Agriculture] (*U. S. Dept. Agr. Yearbook 1934*, pp. 147-149, 194-197, 222-225, 265-275, 290-292, 296-298, 305, 306, 330-332, figs. 6).—Information obtained in studies with livestock is presented under the following headings: Soybeans Content of Amino Acids Varies Greatly with Variety, by D. B. Jones and F. A. Csonka (pp. 330-332); Beef Grade is Affected Chiefly by Feeder Grade and the Feed-Lot Gain, by O. G. Hankins and L. B. Burk (pp. 147-149) Meat May be Chilled and Cured Successfully in a Home-Made Cooling Box, by K. F. Warner and T. A. H. Miller (pp. 265-268); Pork of Good Quality Grown Efficiently on Corn-Soybean Ration, by J. H. Zeller and O. G. Hankins (pp. 290-292); Pastures Offer Sound Means of Decreasing Feed and Food Surplus, by E. W. Sheets and A. T. Semple (pp. 268-272); Pastures Reduce Cost of Producing Livestock and Increase Profits, by H. N. Vinall and M. A. Hein (pp. 272-275); Foals Deprived of Dam's Colostrum May be Saved by Feeding Horse Serum, by I. P. Earle and J. A. Gamble (pp. 222-225); Eggs Oiled by Vacuum Carbon Dioxide Method Keep Well in Storage, by T. L. Swenson and L. H. James (pp. 194, 195); Egg Quality, Controlled by Breeding and Feeding, Increases Poultry Income, by M. A. Jull and T. C. Byerly (pp. 195-197); Poultry Meat Production Costs Reduced by Crossbreeding and Good Diets, by C. W. Knox and H. W. Titus (pp. 296-298); and Rabbit-Raising Profits Materially Influenced by Age at Marketing, by F. G. Ashbrook and C. E. Kellogg (pp. 305, 306).

[Experiments with livestock in Idaho] (*Idaho Sta. Bul. 205 (1934)*, pp. 10, 11, 19, 20, 27, 57-60, 64, 65, 66-68, figs. 2).—Information obtained in tests with livestock are reported on the benefits to fattening steers of warm drinking water and shelter, increasing the efficiency of sweetclover pasture by the

addition of fall-sown wheat or rye, supplemental mineral feeding for fattening lambs and for the breeding flock at the Aberdeen Substation, and lamb and calf feeding tests at the Caldwell Substation.

In tests with poultry data were obtained on Idaho limestone as a substitute for oyster shell, peas of the green-seeded varieties as sources of vitamin A, effect of the pigment in peas on the yolk color, the superiority of cod-liver oil to sardine oil as a source of vitamin A, and the development of lesions in growing chicks on vitamin A-deficient rations.

[Livestock experiments in Kentucky] (*Kentucky Sta. Rpt. 1933, pt. 1, pp. 49, 51, 52-55*).—Investigations with livestock yielded results on a comparison of soybean hay and alfalfa for steer feeding, cost of raising beef cattle and the returns, contaminated v. clean ground in raising pigs, and acidosis of pregnant ewes.

With poultry, data were obtained in studies on the effect of feeding vitamin D supplements to chickens, and the effect of cod-liver oil on the iron and copper content of egg yolk.

[Experiments with livestock in New Jersey] (*New Jersey Stas. Bien. Rpt. 1932-33, pp. 5-9, 15, 16, 70-72*).—Data have been obtained in investigations on the vitamin A and D content of various feeds and the requirements of different animals for these vitamins, by W. C. Russell; and a comparison of animal and vegetable protein combinations on the growth of swine, and studies on the nutritive values of different fish meals, both by W. C. Skelley.

With poultry, studies were undertaken on the possible usefulness of certain short-time egg-yield records as reliable criteria in selecting breeding stock, inheritance of egg size, and early roosting as a cause of crooked keels, all by W. C. Thompson.

The nutritive properties of protein, vitamins B and G, and the germ in rye, D. W. JOHNSON and L. S. PALMER (*Jour. Agr. Res. [U. S.], 49 (1934), No. 2, pp. 169-181, figs. 4*).—The Minnesota Experiment Station conducted studies to obtain a better understanding of the cause of the retarded growth of swine receiving rye as the grain portion of the ration. Rats were fed rye and a liver-meal product and rye plus the liver-meal product at a 10-percent protein level in order to determine the biological value of the proteins of the rye. A meat meal, made from beef muscle tissue, was fed to determine whether other meat products would have an effect similar to the liver meal. The amino acid deficiencies, the vitamin B and G content, and the possible toxicity of rye germ were studied also.

It is concluded that the favorable effects on growth from the liver-meal supplement were not due to an enhancement of the biological value of the protein mixture. The muscle meal had a favorable effect similar to that obtained with liver meal. Lysine was a limiting amino acid of the proteins of rye. At the levels usually fed to livestock it was not likely that rye would be deficient in vitamins B and G. When fed as 10 percent of a complete ration rye germ did not retard the food intake or growth of rats.

Brewery, distillery, vinegar, and yeast by-products for feeding livestock, E. W. SHEETS, A. T. SEMPLE, and J. B. SHEPHERD (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., A. H. Mimeogr. No. 1 (1934), pp. 8*).—The feeding value for the various classes of livestock is discussed of the several byproducts obtained from cereal grains in the manufacture of beer, whisky, and alcohol.

Commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 201 (1934), pp. 28, fig. 1*).—This is a condensed report of commercial feed inspection for 1933 and includes information pertaining to the Indiana Feeding

Stuffs Law and to the composition of feeding stuffs. A table lists the results of inspection of the 2,592 samples of feeds and gives the number of samples passed, not passed, or not tagged (E. S. R., 69, p. 841).

Analyses of commercial feeding stuffs and registrations for 1934, C. S. CATHCART (*New Jersey Stas. Bul.* 573 (1934), pp. 60).—Analyses are reported for protein, fat, and fiber of 1,892 samples of commercial feeding stuffs collected for official inspection during the year 1933, including a list of the ingredients found microscopically (E. S. R., 70, p. 73).

Inspection of feeds, W. L. ADAMS and A. S. KNOWLES, JR. (*Rhode Island Sta. Ann. Feed Circ.*, 1934, pp. 20).—The guarantees and analyses for protein and fat of 304 samples of feeding stuffs collected for official inspection in 1933 are reported.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 372 (1934), pp. 47).—This is a report on 1,955 samples of feeding stuffs officially analyzed for protein, fat, and fiber content as of December 1933 (E. S. R., 70, p. 662).

Eleventh annual report of the National Live Stock and Meat Board's accomplishments during the fiscal year 1933-34, R. C. POLLOCK (*Natl. Livestock and Meat Bd. Ann. Rpt.*, 11 (1934), pp. 115, figs. 122).—This report (E. S. R., 71, p. 520) contains accounts of research work on meat nutrition and the quality and palatability of meat. Brief accounts are also given on the publicity and information regarding meat that were disseminated during the year.

Beef cattle feeding experiments, H. HACKEDORN and R. McCALL (*Washington Sta. Bul.* 302 (1934), pp. 16, figs. 4).—A series of experiments was undertaken to assist in determining if the feeding of cattle in the State should be increased, the type of cattle to feed, and the most economical rations to use.

The fattening of calves was found to require more careful feeding, a higher proportion of grain in the ration, and a longer feeding period than was necessary for older cattle. Calves made greater gains per unit of feed consumed and when finished at weights of from 700 to 1,000 lb. commanded a higher market price than heavier animals.

A ration of alfalfa hay and grain produced 15 percent more gain of 2-year-old steers than did a ration of wheat hay and the same amount of grain. The alfalfa hay and grain ration produced 35 percent greater gains on calves than the wheat hay and grain ration. Equal parts of alfalfa and wheat hays were as efficient for calves as alfalfa hay alone. In a ration of grain, wheat hay, and 0.5 lb. of meat meal, 1 lb. of the latter feed replaced approximately 2 lb. of grain. When fed in combination with alfalfa hay (E. S. R., 44, p. 471), 1.3 lb. of pea straw was equivalent to 1 lb. of alfalfa hay for fattening 2-year-olds.

Feeding grain to beef calves on pasture before weaning, C. I. BRAY (*Louisiana Sta. Bul.* 249 (1934), pp. 19, figs. 5).—A series of four experiments was undertaken to compare creep feeding beef calves with the usual practice of allowing them to run on pasture.

An average gain of 50 lb. more per head was obtained by creep feeding the calves. The average daily gain for all the creep-fed calves was 1.8 lb. per head as compared with 1.4 lb. for the calves on pasture alone. Creep feeding not only increased the rate of gain of calves but increased their value per head more than enough to pay for the feed consumed. Creep feeding for 70 days was found to be profitable in one test, but it was not as satisfactory as feeding for 133 days.

The advantages of creep feeding and the factors determining whether or not this system will be profitable are discussed.

Beef production and quality as influenced by crossing Brahman with Hereford and Shorthorn cattle. W. H. BLACK, A. T. SEMPLE, and J. L. LUSH (*U. S. Dept. Agr., Tech. Bul. 417 (1934), pp. [1]+54, figs. 10*).—In cooperation with the Texas Experiment Station and the King Ranch, Kingsville, Tex., the U. S. D. A. Bureaus of Animal Industry, Agricultural Economics, and Home Economics compared crossbred Brahman-Hereford and Brahman-Short-horn steers with typical Hereford and Shorthorn steers for periods ranging from 1 to 3 yr. with respect to feed-lot performance, market desirability, size and weight of various parts of the body, and characteristics of the meat.

There was no significant difference in feed consumed in proportion to weight, but the crossbreds ate considerably more grain and cottonseed cake and a little more hay per 100 lb. of grain. The crossbreds required more time to consume their feed than did the Hereford and Shorthorn steers. The crossbreds were heavier and returned more profit per head at weaning time than did the other calves, and in a 120-day dry-lot feeding period the crossbreds were valued at a slightly higher price per pound and returned more money per head, even though the feed costs were slightly higher. After feeding periods of from 150 to 179 days there was a tendency for this condition to be reversed. Over a long feeding period the non-Brahmans made more economical gains than the crossbreds.

There was no significant difference in shrinkage from feed lot to market. The crossbreds dressed from 2 to 4 percent higher than the Herefords and Shorthorns, but the dressed meat of the non-Brahmans was appraised slightly higher than that of the crossbreds. On the average the crossbreds had smaller heads, larger hides, and smaller digestive tracts than the Herefords and Shorthorns.

There was no significant difference in the grading score of the carcasses. The rib cuts from crossbreds had a slightly higher proportion of edible meat to bone than the similar cuts from other lots. The chemical composition and color of the meat showed no consistent differences. The texture of the meat from the crossbreds was consistently coarser and slightly less tender than meat from the non-Brahmans, but there were only slight differences in palatability. When all factors were considered the meat from the different lots appeared to be equally desirable.

[Experiments with sheep at the Moses Fell Annex Farm] (*Indiana Sta. Circ. 203 (1934), pp. 17-20, fig. 1*).—Results are reported from studies on a comparison of types of ewes and a comparison of the feeding qualities of Merino lambs and Southdown-Merino crossbred lambs.

Sheep management. W. C. SKELLEY (*New Jersey Stas. Circ. 319 (1934), pp. 16, figs. 8*).—The points to be considered in the successful management of sheep are discussed, including selection of stock, breeding, feeding, and control of parasites and sick sheep.

A feeding comparison of ground corn fodder, corn silage, and ground hégari fodder for fattening lambs. P. E. NEALE (*New Mexico Sta. Bul. 222 (1934), pp. 19*).—This series of trials was conducted to determine the roughages most suitable and palatable and which would at the same time give the best results for fattening lambs under New Mexico conditions. In the first trials 8 lots of 26 lambs each and in the second and third trials 10 lots of 20 lambs each were fed for 99, 90, and 80 days, respectively. The lots received various roughages or combinations of roughages supplemented with cottonseed meal or molasses and cottonseed meal.

The results indicated that from 0.7 to 1 lb. or more of concentrate per day should be fed with ground corn fodder or silage to produce slaughter lambs fed for a 90-day period. Adding alfalfa hay did not increase the rate but did

increase the cost of gains with these rations. On the average 2.5 lb. of silage produced the same gain as 1 lb. of ground corn fodder. The silage produced more gain on an acre basis than did the fodder. Cane molasses did not increase the gains when added to ground hegari fodder as it did when added to ground corn fodder. The hegari fodder was more palatable than the corn fodder. Lambs fed hegari fodder required less dry feed per pound of gain than those fed corn fodder, but about the same as those fed silage. The hegari fodder was cheaper and easier to grind than corn fodder.

Feeding cottonseed meal at the rate of 0.8 lb. per day had no effect on the health of lambs. When silage was the only roughage lambs stayed on feed as well as those in other lots. Any fattening grain could be used to replace the cottonseed meal and molasses after enough cottonseed meal was added to balance the ration.

Linseed meal for growing and fattening lambs, T. B. KEITH and W. L. HENNING (*Pennsylvania Sta. Bul. 307 (1934), pp. 12, figs. 2*).—A series of five tests, using the paired-feeding method, was undertaken to determine the value of linseed meal for replacing part of the yellow corn in a ration of alfalfa hay and corn for growing and fattening lambs. The linseed meal was used to replace 5, 10, and 20 percent of the corn.

A ration of good quality alfalfa hay and corn was not improved, as measured by the rate of gain, by the addition of linseed meal. The alfalfa hay and corn ration, when fed in equal parts, contained sufficient digestible crude protein for growing and fattening lambs. It was estimated that the basal ration furnished 2.9 lb. of digestible crude protein per 1,000 lb. of live weight. Linseed meal did increase the palatability of the basal ration. It is concluded that when the cost of 1 lb. of linseed meal was the same as or less than an equal amount of corn it could be economically fed to growing and fattening lambs on a ration of corn and alfalfa hay.

Influences on the quality of wool, N. L. TINLEY (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 155-158, figs. 2*).—As a result of the examination of the grading of 3,000,000 lb. of Kent or Romney Marsh wool the author concluded that wool from the Romney Marsh district, where the pastures are thick and lush, had a higher proportion of coarse fibers than wool produced on the chalk formation, where the grass is thin and sparse. It was also observed that during a wet season when the growth of the grass was heavy the proportion of wools of the coarser grades was greater than during a dry season when grass was scarce. These observations indicate that thin, sparse pastures encourage the growth of the finer grades of wool and vice versa.

The farm horse—its feeding, care, and breeding, J. L. EDMONDS and C. W. CRAWFORD (*Illinois Sta. Circ. 424 (1934), pp. 38, figs. 11*).—This publication was prepared to assist farmers with the problems of feeding, care, breeding, and selection of farm horses.

Selecting hens for egg production, J. P. QUINN (*U. S. Dept. Agr., Farmers' Bul. 1727 (1934), pp. II+18, figs. 8*).—The basis for selecting profitable hens, the relative emphasis to place on the various features used in this selection, the methods of developing high-laying strains through selection, and management practices to be observed are discussed.

Use of the standard in poultry breeding, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 21 (1934), No. 3, pp. 4*).—The value of the established standards for the various breeds and varieties of fowls and their economic importance are discussed.

Importance of minerals and proteins in feeding poultry, C. W. UPP (*Louisiana Sta. Circ. 12 (1934), pp. 3*).—The value of minerals and proteins in poultry rations is discussed, and recommendations are made for their use.

Comparative metabolism of several calcareous materials used in poultry feeding, W. C. TULLY and K. W. FRANKE (*South Dakota Sta. Bul.* 287 (1934), pp. 32, figs. 5).—A series of tests covering a period of 5 yr. was undertaken to compare several calcareous materials (E. S. R., 64, p. 668) as sources of calcium for laying hens.

It was found that a lack of calcium in an otherwise adequate ration caused a marked decrease in production and loss of eggshell strength. Adding calcareous materials to such a ration stimulated the calcium secreting part of the oviduct within 24 hr. after such feeding was started. No significant difference was found in favor of the following supplements so far as egg production, egg weight, or breaking strength of shell was concerned: Oyster shell, clam shell, chalkstone, Black Hills limestone, dolomitic limestone, calcite, or commercial limestone. Because of excessive consumption dolomitic limestone was not an economical supplement.

A description of a simple apparatus for testing shell breaking strength and a complete report of a chemical analysis of the supplements used are included.

Factors influencing a malformation of the leg bones of growing chickens, T. T. MILBY (*Iowa Sta. Res. Bul.* 172 (1934), pp. 221-252, figs. 3).—This investigation, consisting of two experiments, was undertaken to determine the cause or causes of slipped tendon in chickens.

On a basal ration of ground yellow corn, wheat middlings, and dried skim milk, in which the amount of calcium was held practically constant, the incidence of slipped tendon increased as the amount of added phosphorus increased. The relation between the amount of phosphorus in the ration and the incidence of slipped tendon was not linear, indicating that other factors may influence the occurrence of this condition. Groups of chicks fed the same ration at different times grew at the same rate and, while the incidence of slipped tendon was not the same, the relation between the numbers of slipped tendon on the various rations was the same.

The lowest amount of phosphorus in the above ration that produced slipped tendon was 0.9 percent. When the phosphorus content of the ration was held practically constant at 1.4 percent and calcium was fed at levels of 0.3, 1.4, and 2.3 percent, the incidence of slipped tendon was lower on the low level of calcium.

About 24 percent of the chicks fed a basal ration of ground yellow corn, alfalfa leaf meal, dried skim milk, and ground oyster shell developed slipped tendon, even though the ration contained only 0.4 percent of phosphorus. Increasing the phosphorus content of this ration to 1.3 percent increased the incidence of slipped tendon 78 percent. Replacing the alfalfa leaf meal with 20 percent of wheat middlings and keeping the phosphorus content at 1.4 percent caused about 45 percent of slipped tendon, while replacing the wheat middlings with rice bran eliminated the trouble.

There was no significant difference in the percentage of ash in the dry, fat-free femurs, tibias, and metatarsi of chicks affected with slipped tendon and the controls. On a ration containing 0.4 percent of calcium and 0.6 percent of phosphorus the ash content of the femur was significantly lower in 10-week-old chicks than in similar chicks on a control ration, but the percentages were not as low as those generally given for rachitic chicks. A ration containing 3 percent of magnesium carbonate significantly lowered the percentage of ash in the femurs as compared with a ration not containing this mineral.

The vitamin D requirements of chickens, J. S. CARVER, E. I. ROBERTSON, D. BRAZIE, R. H. JOHNSON, and J. L. ST. JOHN (*Washington Sta. Bul.* 299 (1934), pp. 40, figs. 3).—The results are reported of a study of the vitamin D

requirements of chicks from 1 day to 24 weeks of age and of the same pullets through an 18-month laying and breeding period.

Growing pullets confined without sunshine from 1 to 16 weeks of age required a minimum of approximately 17 international units of vitamin D per 100 g of feed for satisfactory calcification and growth. From 16 to 24 weeks of age pullets handled in the above manner required a minimum of approximately 8 international units of vitamin D. There was apparently sufficient ultraviolet light from sunshine during the period from May to September to supply pullets with the necessary amount of vitamin D for calcification and growth from 6 to 24 weeks of age. When cod-liver oil supplied the required amounts of vitamin D the addition of ultraviolet light from sunshine did not appear to increase or retard growth. The calcification of the tibias was practically completed at 16 weeks of age. The crookedness of keel bones of pullets receiving no vitamin D was more marked at 24 weeks than at 8 or 16 weeks. The lack of this vitamin appeared to increase the extent and severity of crooked keel bones.

Pullets stored enough vitamin D during the growing period to last through 3 mos. of egg production. The lack of vitamin D either from cod-liver oil or sunshine seriously retarded egg production. Eggs produced while birds were receiving a sufficient supply of vitamin D were normal in weight, but an inadequate supply of the vitamin markedly reduced the average egg weight. Hens confined without sunshine required 67 international units of vitamin D per 100 g of ration for satisfactory egg quality, but when the birds were exposed to sunshine no supplemental vitamin D was necessary. Without sufficient vitamin D the lower egg production and egg size were accompanied by inferior quality of shell.

In order to produce eggs that hatched satisfactorily, hens confined without sunshine required 135 international units of vitamin D per 100 g of feed. Pullets having access to sunlight from December 10 to March 4 required an additional 34 units of vitamin D to obtain satisfactory hatching records. For the remainder of the year it was not necessary to supplement the sunshine for satisfactory hatchability.

A comparison of the nutritive values of cottonseed meal, alfalfa leaf meal, and meat and bone scraps in a ration for growing chicks, L. N. BERRY (*New Mexico Sta. Bul. 221 (1934), pp. 16, fig. 1*).—A series of experiments covering a 3-year period was undertaken to compare the nutritive value of various protein supplements for growing chicks. In each experiment 5 lots of birds were fed the different starting rations until they were 8 weeks old. They were then changed to growing rations which were of the same nature as the starting rations used in the respective pens. At 24 weeks they were all placed in the same laying house, given the same ration, and trap-nest records kept during their first laying year.

The results showed that in a growing mash containing 10 percent of dried buttermilk, cottonseed meal supplied the additional protein necessary for satisfactory growth as efficiently as did meat and bone scraps. Chicks receiving the cottonseed meal grew slower during the first 8 weeks and required more feed per pound of gain, but this disadvantage was overcome by the time the birds were 24 weeks old. Alfalfa meal was not an efficient substitute for either corn gluten meal or meat and bone scraps. The use of either cottonseed meal or alfalfa meal in the growing ration had no effect on the birds' ability to produce eggs during the first laying year.

The quantitative relation of egg yolk pigmentation to pimiento feeds, W. L. BROWN (*Georgia Sta. Bul. 183 (1934) pp. 8*).—This study was under-

taken to develop a method for determining capsanthin in egg yolk, to determine the ratio of capsanthin in the feed to that deposited in the yolk, and to obtain a more definite color standard for defining egg yolk color (E. S. R., 63, p. 862).

A colorimetric method for capsanthin analysis is described.

It was found that pigment began to appear in the yolk after 48 hr. at high production and to be deposited throughout the yolk after about the sixth egg. Adding pimiento to a xanthophyll-free diet in amounts that gave the diet a capsanthin content of 0.35 mg per 100 g produced eggs that had approximately the same depth of yolk color as market eggs. With a feed having 1.83 and 2.74 mg of capsanthin per 100 g, a yolk color was obtained that was much deeper than that of market eggs. Adding 0.5 lb. of dried pimiento to 100 lb. of feed gave the yolk a color depth approximately that of market eggs. High-producing hens tended to lay eggs with a slightly lower than average yolk color. At the higher levels of feeding dried pimiento a greater proportion of capsanthin was deposited in the yolk, due probably to the greater saturation of the body tissues with pigment. There was no deterioration in color of deeply pigmented yolks or in the appearance of the white after 1 yr. in cold storage.

The effect of different methods of packing on quality of eggs, W. H. DRYDEN (*Harper Adams Util. Poultry Jour.*, 19 (1933-34), No. 5, pp. 206-211).—In tests at the Agricultural Research Station, Hillsborough, Northern Ireland, it was found that packing eggs with the broad end up was definitely superior for keeping eggs in good condition whether in transit or undisturbed in the store to packing with the broad end down.

Observations on the above eggs showed that the presence of a tremulous or running air cell did not indicate that the egg had a watery white or was "weak." It was concluded that eggs with tremulous air cells should not be excluded from first-quality grade provided there are no signs of deterioration in other respects.

Will Louisiana eggs keep? C. W. UPP (*Louisiana Sta. Circ.* 13 (1934), pp. 8).—The results of experimental work with eggs previously reported (E. S. R., 68, p. 82) are summarized, together with suggestions for improving the quality of market eggs.

Segregating baby chicks at hatching time (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., A. H. Mimeogr. No. 2* (1934), pp. 2).—Instructions for sexing baby chicks are presented.

Some observations on humidity and weight loss in the incubation of turkey eggs, F. E. MUSSEHL and C. W. ACKERSON (*Nebraska Sta. Res. Bul.* 74 (1934), pp. 11, figs. 3).—In this investigation it was found that turkey eggs incubated under chicken hens lost from 11 to 13 percent of their original weight during the first 24 days of incubation. The loss was relatively more for small eggs than for large eggs incubated under the same conditions. A range of weight loss of from 7 to 24 percent of the original weight was observed during the first 24 days of incubation of eggs of approximately the same size and incubated in the same environment. The differences may have been due to variations in shell texture, but care had been emphasized in selecting apparently normal eggs with good texture.

There was no significant correlation between weight losses during incubation and growth rate of poults during the first 8 weeks of life. The rate of air movement and humidity had more apparent influence on hatchability during the last 4 days than during the first 24 days of incubation. Cabinet incubators required somewhat different conditions during the last 4 days of incubation for turkey eggs than for chicken eggs.

DAIRY FARMING—DAIRYING

[**Dairying studies by the U. S. Department of Agriculture**] (*U. S. Dept. Agr. Yearbook 1934*, pp. 156, 157, 175-185, 340-343, 360-363, figs. 3).—Under the following general headings information on dairying subjects is discussed: Dairy Cow's Udder Studied to Establish Development Standards, by W. W. Swett and C. A. Matthews (pp. 175-181); Virgin Animals Secrete Milk After Injections of Pituitary Hormone, by E. I. Evans (pp. 360-363); Dairy-Ration Tests Show Importance of Vitamin A in Roughage, by E. B. Meigs (pp. 181-183); Casein Manufacturing By New Methods Cuts Costs, Improves Product, by R. W. Bell (pp. 156, 157); Swiss-Cheese Making Depends Greatly on Control of Bacteria, by W. C. Frazier (pp. 340-343); and Dairy Sires Proved at Earlier Age by Lactation Records, by J. F. Kendrick (pp. 184, 185).

[**Experiments with dairy cattle and dairy products in Idaho**] (*Idaho Sta. Bul. 205 (1934)*, pp. 34-39, 68, 69, fig. 1).—Experiments with dairy cattle yielded results on the use of proved sires in breeding high-producing cows, water requirements of dairy cows and calves, the value of the pellet form of commercial calf meals, effect of the digestive tract on the viability of weed seeds, mastitis and low curd tension of milk, and pasture mixtures and the chemical composition and vitamin content of pasture grasses at the Caldwell Substation.

Results in studies with dairy products are reported on the reduction of curd tension of milk by homogenization, manufacturing high-quality casein, and the effect of the type of container on the composition of butter.

[**Dairy experiments in Kentucky**] (*Kentucky Sta. Rpt. 1933*, pt. 1, pp. 49, 58, 59).—Information was obtained on the cost of raising dairy heifers and the effect of preservatives on the keeping quality of cream samples.

[**Dairy experiments in New Jersey**] (*New Jersey Stat. Bien. Rpt. 1932-33*, pp. 29-34).—Experiments with dairy cattle furnished data on a study of inbreeding and outcrossing of Holstein cattle in establishing genetic factors for high milk and fat production, by J. W. Bartlett; a study of methods of winter feeding of heifers, beet pulp v. pineapple bran as a source of succulence for dairy cows, the effect of nitrogen fertilization on the protein content of corn silage, and the effect of nitrogen fertilization on the carrying capacities of pasture, all by C. B. Bender.

Dairy products studies yielded information on the effect of butter as a source of fat on the whipping ability of ice cream mix, by F. C. Button; and a study of the effect of certain triglycerides and fatty acids on the processing of ice cream, churning of butter, and whipping of cream, by Button and D. Levowitz.

[**Experiments with dairy cattle and dairy products in Vermont**] (*Vermont Sta. Bul. 380 (1934)*, pp. 7, 8, 13, 14, 15).—Results of tests with dairy cows are reported on the value of succulent feeds in dairy rations; the value of early-cut Sudan grass hay and silage as a grain saver; chopped hay for dairy cows; the effect of the nutritional plane on utilization of nutrients by the dairy cow, including the consideration of sundry phases of mineral metabolism; and digestibility of artificially dried Sudan grass.

With dairy products information was obtained on shrinkage and changes in quality in ice cream stored in small packages.

Feed consumption of dairy cattle during growth, A. C. RAGSDALE (*Missouri Sta. Bul. 338 (1934)*, pp. 16, figs. 2).—Complete data are presented on the feed consumption of Holstein, Jersey, and Ayrshire cattle from birth to 2 yr. of age. The data are based on records maintained at the station since 1923. The evidence shows that the feed consumption per pound of gain increased

steadily with increasing age and live weight. At 3.5 mo. of age the gain per pound of feed consumed was eight times as great as at 2 yr. of age. There was no breed difference in the efficiency of feed utilization.

Cost of raising dairy heifers, C. H. STAPLES and R. H. LUSH (*Louisiana Sta. Circ. 9* (1934), pp. 9).—Records maintained on 64 heifers to freshening showed that on the average it required 888 lb. of whole milk, 3,167 lb. of skim milk or its equivalent, 1,059 lb. of grain, 2,303 lb. of hay, and 2,214 lb. of silage to feed each animal. At the prices charged this feed cost was \$65.64 on farms selling whole milk and \$41.31 on farms selling butterfat. Adding pasture charges brought the cost to \$94.57 and \$55.77, respectively. These figures indicate that it is economical to raise fewer but larger calves.

Suggestions are presented for the feeding and management of heifers from birth to calving.

Alfalfa-timothy hay for the dairy farm.—II, Increased hay feeding for dairy cows, C. F. MONROE and H. ALLEN (*Ohio Sta. Bul. 538* (1934), pp. 21–41, fig. 1).—A series of four comparisons was made at the Trumbull County Experiment Farm to study the effect of increasing the rate of hay feeding on the amount and cost of milk production. The hay used consisted mostly of early-cut mixed alfalfa and timothy and a small amount of early-cut, high-quality clover. Rations made up of 30 lb. of hay and 15 lb. of corn silage were compared with rations of 15 lb. of hay and 40 to 45 lb. of silage. With the heavy hay ration a grain mixture of corn, oats, and wheat bran 40:40:20 was fed in limited amounts, while with the light hay ration a 13.2 percent digestible protein grain mixture was fed more liberally. Cows on the heavy hay ration produced a little less milk but almost as much butterfat, the feed costs were lower, and the returns over feed costs higher than with cows receiving a light hay ration. A moderate hay ration with grain feeding reduced gave a lower production and a lower net return, while the same hay ration with the grain not reduced increased both production and return over feed cost. Moderate hay feeding increased the production but not the returns as compared with heavy hay feeding.

Heavy hay feeding was quite satisfactory on the basis of final returns and also for maintaining the cows in a normal state of health. Care should be exercised to see that cows on a heavy hay ration receive sufficient phosphorus.

Suggested methods for growing and feeding mixed alfalfa and timothy hay are presented.

Pampas grass as winter cow-feed, B. C. ASTON (*New Zeal. Jour. Agr.*, 48 (1934), No. 5, pp. 285–291, figs. 4).—The results of 2 years' tests under practical conditions in the use of pampas grass (*Gynerium* (*Cortaderia*) *argenteum*) for dairy cows are described. This grass may yield as high as 50 tons of green matter per acre. It is rich in dry matter when compared with other green fodders and is highly desirable to cattle.

Grain v. no grain for dairy cows, H. S. WILLARD (*Wyoming Sta. Bul. 202* (1934), pp. 24, figs. 2).—In this test lot 1, consisting of six cows, was fed through 15 lactations without grain, while in lot 2 ten cows were fed through 15 lactations on alfalfa hay with ground barley during the winter months. Three of the cows in lot 2 were fed for two or more lactations in lot 1. Alfalfa hay was available at all times to the cows in each group and during the winter the cows in lot 2 received 1 lb. of barley to 5 lb. of milk produced. During the pasture season no grain was fed.

There was no evidence that either ration had an injurious effect on breeding ability. The cows gained in weight with succeeding lactations regardless of the ration. On the average, lot 1 lost more weight and regained more weight

during the lactation period than lot 2. The average yearly production in lot 1 was 9,384 lb. of milk and 310.4 lb. of fat as compared with 10,180 lb. of milk and 323.1 lb. of fat in lot 2. On a mature equivalent basis lot 2 produced 18 percent more milk and 13 percent more fat than lot 1. There was a difference of only 2.1 percent in milk and 2.5 percent in fat production in favor of grain feeding when the records of the three cows fed in both groups were compared on a mature equivalent basis.

The milk production in both groups increased after the cows were turned on pasture and reached a peak at 2 weeks of such feeding. Production then returned to the former level after 5.5 weeks on pasture. The lower the milk yield previous to turning on pasture, the greater was the increase in production. The actual milk yields were increased 43 lb. per cow over the theoretical milk yields on dry feed for 22 cows fed 98 days on pasture. On this basis when alfalfa hay was worth \$5 or \$10 per ton pasture was worth 9.6 and 19.2 ct., respectively, per cow day.

These results indicate that cows of good inherited capacity for milk production will produce well and remain in good health from year to year on a roughage ration without grain.

Alfalfa seed screenings as a feed for dairy cows, F. W. ATKESON, T. R. WARREN, and R. F. JOHNSON (*Idaho Sta. Bul.* 206 (1934), pp. 15).—In this investigation two trials were conducted almost simultaneously, one at Moscow and the other at the Caldwell Substation. At Moscow two groups of four and five cows and at Caldwell two groups of four cows each were fed a basal ration of alfalfa hay and corn silage. The cows were fed according to the double reversal system through three 32-day periods, the first eight days of each being considered a transition period.

Alfalfa seed screenings when substituted at the rate of 200 lb. for 100 lb. of linseed meal as a protein supplement to 400 lb. of barley and 200 lb. of wheat bran gave results equal to those obtained when linseed meal was fed. On a 1,000-lb. basis, 250 lb. of alfalfa seed screenings replaced 143 lb. of linseed meal, 71 lb. of barley, and 36 lb. of bran. While not as palatable as some common feeds, this was not a limiting factor in the use of alfalfa seed screenings when fed as 25 percent of the grain ration.

Minerals for dairy cattle, R. H. LUSH (*Louisiana Sta. Circ.* 10 (1934), pp. 5).—Recommendations are presented for feeding minerals to dairy cattle under different conditions.

Vitamin D in the blood and milk of cows fed irradiated yeast, R. F. LIGHT, L. T. WILSON, and C. N. FREY (*Jour. Nutrition*, 8 (1934), No. 1, pp. 105-111).—Tests with a Holstein cow fed yeast prepared for the commercial production of vitamin D milk showed that this vitamin, present in irradiated yeast, was almost completely absorbed. The evidence indicated a rapid disappearance of vitamin D from the blood stream at a maximum rate of approximately 10 percent per hour, followed by a decline in rate of disappearance as the concentration decreased. The concentration of vitamin D in milk depended upon the concentration of this factor in the blood plasma.

The vitamin E content of certain dairy feeds, I. L. HATHAWAY and H. P. DAVIS (*Nebraska Sta. Res. Bul.* 73 (1934), pp. 7).—Using rats as the experimental animals, the vitamin E content of each ingredient of the ration used in feeding the dairy herd was studied. Female rats that had conceived but were unable to reproduce on a vitamin E-deficient ration were fed the various feeds as a source of vitamin E during a second breeding period. The ability of the animal to reproduce was taken as the measure of the vitamin E content of the feed.

From 20 to 25 percent of bran, shorts, linseed meal, hominy feed, white or yellow corn, cottonseed meal, kafir, or alfalfa provided sufficient vitamin E to permit the females to produce their litters. At the same time it was established that 40 percent of corn gluten meal, corn gluten feed, or beet pulp provided very little vitamin E. The vitamin E content of white and yellow corn was practically the same.

The effect of thyroidectomy and thyroid feeding on the milk secretion and milk fat production of cows, W. R. GRAHAM, JR. (*Jour. Nutrition*, 7 (1934), No. 4, pp. 407-429).—Investigations at the Ontario Agricultural College showed that the removal of desiccated thyroid glands from the diet of thyroidectomized cows resulted in a decrease in milk and fat secretion. Thyroidectomy itself caused a marked reduction in fat secretion, but it was difficult to distinguish this reduction from the accompanying control operations. Adding small amounts of thyroid to the ration of either thyroidectomized or normal cows, when the curve of lactation was falling, resulted in a rapid rise in milk and fat production, after which the normal gradual decline continued. Thyroid feeding during the period of rising milk secretion had no apparent effect on this function, but the slight difference in amount of milk produced might be related to the amount of thyroid fed. Excessive doses of thyroid given to thyroidectomized cows caused a reduction in milk and fat secretion, and the latter function was more greatly influenced than the former. Lactation did not cease when thyroid was removed from the ration of the experimental animals. The effect of this removal on the total milk and fat production appeared to depend on the period in the lactation cycle when the thyroid was removed.

The results showed that the effect produced by the thyroid gland on milk and fat secretion was secondary to the factors controlling the lactation cycle. There appeared to be a relationship between total metabolic rate and the secretion of milk and fat. Fat production was apparently more affected by the presence or absence of thyroid than milk production. It seems possible, therefore, that the characteristic fluctuations in fat production may be due to slight changes in the total metabolic rate of the animals.

Serological test for the blood relationship of some bovines with reference to the racial discernment, K. SASAKI (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, 29 (1934), No. 2, pp. 287-296, figs. 8; *Ger. abs.*, p. 295).—The Kyushu Imperial University, Japan, undertook a study to determine bovine blood relationship by means of a precipitin reaction. The experimental animals, rabbits, were injected with cattle blood sera from different breeds and types.

The results showed that the Taiwan (Formosa) zebu was more closely related to the Holstein-Friesian than to the Taiwan water buffalo. The blood sera of the south Chosen (Korea) cattle could not be distinguished from that of the Taiwan zebu, but could be distinguished from that of the Holstein. Aberdeen-Angus and Holsteins could be readily distinguished, but the Holstein, improved Japanese native cow, and their hybrids could not readily be distinguished.

The inheritance of high butterfat percentage in Holstein-Friesian cattle, J. W. BARTLETT, K. O. PFAU, and H. H. TUCKER (*New Jersey Stas. Bul.* 572 (1934), pp. 16).—A total of 2,088 dam-daughter pairs of Holstein-Friesian cows were compared to determine to what extent cows with records of 600 or more pounds of fat and with high fat percentages pass these records on to their daughters. It was planned also to ascertain what percentage of the high-fat-producing cows have a fat percentage of 4 percent or above and the

influence of the sire on his progeny when mated to high-producing cows with a 4-percent butterfat average.

A correlation surface showed that the average test of all dams was 3.5438 percent of fat, while the daughters averaged 3.5529 percent. About 8 percent of all dams and daughters had a 4-percent or higher butterfat test. The correlation coefficient between dam and daughter was found to be 0.4169 ± 0.0122 . The progeny of 118 sires from 4-percent cows varied widely in their butterfat tests. However, with an increase in the average test of the daughters of a particular sire, the test of his daughters out of certain dams increased to a noticeable degree with the increase in fat test of these dams. There was no significant correlation between the fat test of a sire's dam and the fat test of a sire's daughter.

The functional individuality of the mammary glands of the udder of the dairy cow. C. W. TURNER (*Missouri Sta. Res. Bul. 211 (1934), pp. 51, figs. 11*).—The purpose of this study was to investigate the variation in yield and composition of milk from the individual quarters of a group of cows, noting the changes during entire lactations and from lactation to lactation. The study was made possible by the use of a specially designed milking-machine unit capable of delivering into separate containers the milk secreted by each of the four quarters.

On the average each of the two front quarters produced slightly more than 20 percent of the total milk and each of the two rear quarters slightly less than 30 percent of the total milk yield. The milk production was practically equal from the right and left halves of the udder. Lactation curves of Holsteins and Jerseys showed the general trend in rate of secretion by quarters to be quite uniform throughout the entire lactation period. There was no significant change in the relative production of the four quarters from the first to the second and third lactations.

No tendency was observed for either the front or rear quarters to secrete milk richer in fat than the other, even though there was a marked difference in milk production. It was apparently normal for each quarter to yield milk of uniform composition when secreting to the limit of the gland tissue present. When abnormal environmental conditions cause one or more quarters to decline more rapidly than others in rate of secretion, then the fat test may increase to a certain extent.

The cow as a source of "oxidized" flavors of milk. E. S. GUTHRIE and H. J. BRUECKNER (*[New York] Cornell Sta. Bul. 606 [1934], pp. 10*).—Samples of milk from 155 cows in 5 herds were drawn directly from the udder into sterilized amber-colored milk bottles, pasteurized at 143° F. for 30 min., cooled, and scored for intensity or absence of oxidized flavor after 3 days' storage at about 40°.

About 10 percent of these samples developed slight oxidized flavors. Within the herds the number of cows that produced such milk ranged from 6 to 28 percent. No apparent relationship existed between the breed, period of lactation, or age of the cows, and the development of oxidized flavors. Pasteurizing at 160° or higher for 30 min. decreased or prevented the tendency for the development of this off flavor.

Oxidized flavors did not appear in the skim milk and were slightly stronger in whole milk than in cream. The flavors developed in foremilk, middle milk, and last milk, being a little less noticeable in the foremilk, due probably to the smaller amount of fat present. The intensity of these flavors in the milk of many cows varied from the different quarters of the udder. The flavors were more pronounced and wide-spread in winter than in summer.

The tendency of most cows that produced milk developing this off flavor in winter not to produce such milk in summer was the only indication of a relationship of feed to oxidized flavor. However, the fact that milk from different quarters varied in the intensity of developed flavor indicated that feed was not the sole cause of the condition. The development of this off flavor was not consistent in the milk from individual cows.

Influence of temperature on bacterial growth in pure culture and in mixed flora of milk, J. M. FRAYER (*Vermont Sta. Bul. 377 (1934), pp. 32*).—To determine the effect of delayed cooling on the bacterial content of milk at 75° F., samples were inoculated with 23 different individual organisms in pure culture.

When milk was held for 2 hr. before cooling the average increment in bacterial content was 22 percent, after 4 hr. 221 percent, after 6 hr. 1,230 percent, and after 8 hr. 6,229 percent. Some of the cultures grew rapidly from the first, while others made but slight growth. The low holding temperatures apparently resulted in greater mortality at one point in the growth cycle of some organisms than at other points. The reduction was probably due in some cases to prolonged germicidal effects and in others to individual susceptibility to low temperatures. Combining several pairs of cultures and determining their associated growth gave variable results.

It was concluded that mixed natural milk cultures could not be held uncooled for any length of time without material increment in their bacterial contamination. The effects of delayed cooling and low holding temperature upon raw milk as a blended culture were not uniform and could not be accurately predicted in any given case.

Coliform organisms and keeping quality of milk, H. BARKWORTH (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 194-196, figs. 2*).—Approximately 4,900 samples of morning milk and 5,400 samples of afternoon milk were examined in this test, and the results were tabulated according to total bacterial count, keeping quality, presence of coliform organisms, and the degree of coliform contamination.

The tabulations showed that the presence of coliform organisms shortened the average keeping quality of milk, and that this influence was directly related to the degree of contamination. Initial contamination caused a more marked depressing effect on this factor than did contamination at lower stages. It was concluded that for milk having good keeping qualities low bacterial counts were necessary.

Van Oijen's test: A rapid method for counting high class milk, H. BARKWORTH (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 197-201, figs. 3*).—Estimates of the number of bacteria in milk made by the Van Oijen method (E. S. R., 60, p. 662) gave results that agreed reasonably well with those obtained by the standardized plate technic. This method is cheap, rapid, and reduces the amount of apparatus needed for each test, but does not give an indication of coliform contamination.

Light and temperature as factors in the methylene blue reduction test, J. M. FRAYER (*Vermont Sta. Bul. 374 (1934), pp. 28, figs. 9*).—Continuing these investigations (E. S. R., 68, p. 372), a series of trials was conducted to determine the effect of the holding temperature previous to sampling and the effect of light exposure on bacterial counts of milk. Samples of milk were taken from miscellaneous sources and subsamples (1) when fresh (before cooling and within 30 min. of milking), (2) immediately after cooling to 40° F., and (3) after holding for 24, 48, and 72 hr. at 40°. At each subsampling three sets of duplicates were taken for reduction tests under the following conditions:

(1) Complete darkness, (2) ordinary room daylight, and (3) brilliant electric light. Plate counts were made of many samples for comparison.

Both artificial and natural light exerted a marked reducing action upon methylene blue in milk. To control this factor tests should be conducted in reduced light or in the dark. Holding milk at a low temperature retarded the reduction of methylene blue. This factor should be given consideration in the conduct of such tests.

The manufacture of whipped cream using dry skim milk, W. H. E. REID and W. C. ECKLES (*Missouri Sta. Circ. 180 (1934), pp. 4*).—The use of high-quality dried skim milk to reinforce cream intended for whipping in order to eliminate some of the factors affecting the quality of the finished product and the difficulties encountered in its storage are discussed.

Manufacture of cream cheese involving the use of dry skim milk, W. H. E. REID and H. R. ALLEY (*Missouri Sta. Circ. 179 (1934), pp. 4*).—The advantages of and directions for the use of dried skim milk in the manufacture of cream cheese are presented.

Relation of age and temperature to qualities of ice cream, S. F. SCISM (*Ice Cream Trade Jour., 30 (1934), No. 3, pp. 31, 32*).—In this test 25 pint samples each of chocolate, vanilla, and strawberry ice cream were used. One sample of each flavor was scored the day following freezing, 12 samples of each flavor were placed in a storage room at -25° F., and the other 12 samples were placed in an electric retail cabinet. Every week a sample of each flavor from both storage places was scored at 10° . The samples in the cabinet were removed frequently from the wells and handled similarly to the way they would be handled in a store.

The samples in the low-temperature storage room resisted deterioration exceptionally well. The chocolate ice cream stood up better in both the low-storage room and the mechanical cabinet than the vanilla ice cream and this in turn to the strawberry ice cream. The first noticeable effect of age on vanilla and chocolate was a loss of desirable body and texture, while strawberry ice cream first showed a deterioration in flavor.

Why not make grape ice? J. C. HENING and A. C. DAHLBERG (*Ice Cream Trade Jour., 30 (1934), No. 2, pp. 19, 20*).—In this paper from the New York State Experiment Station the results of experiments on the use of grape juice in the manufacture of ice cream are described.

Proceedings [of the] nineteenth annual meeting, western division, American Dairy Science Association (*Amer. Dairy Sci. Assoc., West. Div., Proc. Ann. Meeting, 19 (1933), pp. [127], fig. 1*).—The proceedings, in mimeographed form, of this meeting, held at Portland, Oreg., October 22, 1933 (E. S. R., 65, p. 566), are presented.

VETERINARY MEDICINE

Veterinary hygiene, R. G. LINTON (*Edinburgh: W. Green & Son, 1934, 2 ed., pp. XIX+472, figs. 129*).—A completely revised, enlarged edition of this work (E. S. R., 46, p. 773).

Text-book of meat inspection (ante-mortem and post-mortem), R. VON OSTERTAG, edited by T. DUNLOP YOUNG, trans. by C. F. MARSHALL (*London: Baillière, Tindall & Cox, 1934, pp. XI+744, pls. 10, figs. 247*).—This is an English edition of the work previously noted (E. S. R., 70, p. 241).

[Contributions by the U. S. Department of Agriculture relating to diseases of livestock and their control] (*U. S. Dept. Agr. Yearbook 1934, pp. 144-146, 337-340, 363-366, figs. 2*).—The results of recent findings in work with

livestock diseases are presented in practical form as follows: Bang's Disease May Enter the Body through Skin or Eye, Recent Studies Show, by W. E. Cotton and J. M. Buck (pp. 144-146); Swine Erysipelas Is More Easily Diagnosed by a New Blood Test, by C. H. Hays and C. F. Harrington (pp. 337-340); and Tuberculosis of Poultry Is Being Greatly Reduced by Disposing of Old Hens, by E. Lash (pp. 363-366).

[Contributions on epizootic diseases and parasites] (*Off. Internatl. Épizoot. Bul.*, 8 (1934), No. 1, pp. 1-434, figs. 10).—Contributions presented at the Eighth Conference of the International Office of Epizootics are included, the translated titles of which are as follows: The Sanitary Situation in 1933, by E. Leclainche (pp. 1-18); The Osteodystrophic Diseases of Domestic Animals, by A. Theiler and H. H. Green (pp. 19-117); A Critical Discussion of the Etiology and Prophylaxis of Hemorrhagic Septicemia, by R. Manninger (pp. 118-155); The Standardization of Biological Products, by F. Gerlach (pp. 156-191); Standardization of Biological Products, of Serums, and of Vaccines, by L. F. D. E. Lourens (pp. 192-240); The Infectious Diseases of Poultry, by C. Cernaianu (pp. 241-323); Fowl Pest (Fowl Plague), by A. M. Rachad (pp. 324, 325); Johne's Disease (Paratuberculosis) in France: Epidemiology and Prophylaxis, by P. Rinjard (pp. 326-353); Combating the Monieziasis: Invasions of Sheep by Tapeworms (pp. 354-378) and Combating the Helminthiasis of Poultry (pp. 379-413), both by K. J. Skriabine and R. S. Schulz; Dourine and Its Prophylaxis, by Eyraud (pp. 414-429); and The Use of Vaccines against Fowl Pest, by S. Kondo and N. Nakamura (pp. 430-434).

[Report of work in animal pathology at the Idaho Station] (*Idaho Sta. Bul.* 205 (1934), pp. 28-34, figs. 3).—Work here briefly reported includes studies of the cause and means of control of sheath necrosis in bucks (particularly with the value of copper sulfate), mastitis in cattle, fowl paralysis or lymphomatosis of poultry, pullorum disease of poultry, eradication of bovine infectious abortion of dairy herds, and udder infections.

[Report of work in animal pathology at the Kentucky Station] (*Kentucky Sta. Rpt.* 1933, pt. 1, pp. 46, 47, 55, 56).—Brief reference is made to studies during the year (E. S. R., 70, p. 240) with hemolytic streptococci, the agglutination test for pullorum disease, bovine and equine infectious abortion, and delayed conception and sterility in dairy heifers.

On the pleomorphism of bacteria.—I, On the pleomorphism of *B. paratyphi* B, I. L. KRITSCHESKI and I. W. PANOMAREWA (*Jour. Bact.*, 28 (1934), No. 2, pp. 111-126, figs. 14).—The authors conclude from studies conducted at Moskva (Moscow), U. S. S. R., that the bacillary form of *Bacillus paratyphi* B (Schottmüller) although more frequently found, may be regarded as only one of many possible forms of existence of this micro-organism, and that because of this, pleomorphism of bacteria should be considered as a proved fact.

Variations in the electrophoretic mobilities of the *Brucella* groups, D. E. SMITH and E. W. JOFFE (*Jour. Bact.*, 28 (1934), No. 2, pp. 127-131).—The authors have measured the electrophoretic mobilities of certain strains of the *Brucella* group. They find that the great variability within a single culture and the overlap of the groups prevent the establishment of any constant relationships between virulence or cultural characteristics and ζ -potentials. "On account of the overlap of these groups it is impossible to refer an unknown strain definitely to one group.

"In general, the strains of the bovine group exhibit the lowest electrophoretic mobility and some of the caprine strains from human sources the highest. The porcine strains show an intermediate mobility. Whether there

is any difference in the electrophoretic mobility of dissociated strains, as is the case in the colon-typhoid group, we hope to determine shortly."

Coccidia and coccidiosis of domesticated, game, and laboratory animals and of man, E. R. BECKER (*Iowa State Col., Div. Indus. Sci. Monog. 2 (1934), pp. IX+147, figs. 25*).—In this work of 23 chapters and 3 appendixes the author has brought together descriptions of the species of *Coccidia* found in various domesticated, game, and laboratory animals and man, together with additional information including the conclusions drawn from the investigations of the last few years in the field of host-parasite relationships. Suggested readings on *Coccidia* of some vertebrate hosts not treated in the text (pp. 111, 112), host-catalog of the genera of *Coccidia* having representatives in the digestive tract of vertebrates (pp. 113–120), and notes on technic (pp. 121, 122) are presented in the appendixes, and a bibliography (pp. 122–137) is included, as are author and subject indexes.

Under the name *Iso spor a suis* a new species affecting the pig, as previously noted (E. S. R., 71, p. 848), is characterized in an addendum (pp. 106, 107) by H. E. Biester.

A method of estimating the number of worms present in the fourth stomach and small intestine of sheep and cattle for the definite diagnosis of parasitic gastritis, E. L. TAYLOR (*Vet. Rec., 14 (1934), No. 18, pp. 474–476*).—The author describes a method for making counts of the actual number of worms recovered at post-mortem examination, which requires about 1 hr.

A table is given which shows some observed variations in the egg-worm ratio in parasitic gastritis.

Agglutinative action of normal blood serum on granules in vas deferens of ascarids, K. MOMMA (*Arch. Schiffs u. Tropen Hyg., 38 (1934), No. 7, pp. 273–282, figs. 5; Ger. abs., p. 281*).—Four series of experiments reported upon, aimed at the differentiation of ascarid species, were based upon the finding in the summer of 1929 that (1) the granules in the vas deferens of ascarids were agglutinated by normal blood serum from various mammals (man, dog, rabbit, and cat) and that (2) normal blood serum, which after addition of an excess of the granules was shaken for a minute and centrifugalized, no longer exhibited its agglutinative action on the granules from the same species. "Normal blood serum (rabbit) absorbed by the granules from pig ascaris has shown the agglutinative action neither on the granules from pig ascaris nor those from human ascaris. The existence of the reverse relation is also evidenced. Both species cannot be distinguished by means of the agglutination phenomenon of the granules in vas deferens of ascarids. These experimental results are able to offer a new ground for the identity of both species."

Mouse plague investigations, D. MURNANE (*Jour. Council Sci. and Indus. Res. [Aust.], 7 (1934), No. 1, pp. 45–49, fig. 1*).—In a study made during the course of an outbreak of an infectious disease among mice in Victoria in 1932 the causal organism was isolated and identified as *Salmonella (Bacillus) enteritidis*, first described by Gaertner in 1888. It is pointed out that this is a member of the food poisoning group affecting human beings. The disease is readily transmitted to mice by ingestion but, due to its pathogenicity for man, cannot be employed in control of mouse plagues.

The electric charge of rinderpest virus, T. TOPACIO (*Philippine Jour. Sci., 51 (1933), No. 4, pp. 637–644, fig. 1*).—The rinderpest virus was found to carry a positive charge in a solution of pH 5.2. Near the blood range, pH 7.2, the particles uniformly carried a negative charge, while at pH 6.2 they may either be positively or negatively charged, as shown by the success or failure of producing infection with paper segments exposed to a solution of such hydrogen-ion concentration.

The occurrence of estrus in cattle during pregnancy, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 404, 405).—This is a report of several cases observed at the Indiana Experiment Station.

Brachial aneurysm in a Hereford steer, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 402-404, fig. 1).—This is a case report contributed by the Indiana Experiment Station.

***Brucella abortus* in the serous effusion of the hip-joint of a cow**, A. L. DELEZ (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 405, 406).—Contributing from the Indiana Experiment Station, the author reports upon the finding of *B. abortus* in the fluid from a swelling of the hip joint of a Jersey cow that had aborted 3 mo. previously. The animal was 8 yr. old and had aborted twice. The first abortion occurred 14 mo. previous to the second.

The eradication of bovine contagious abortion, A. W. STABLEFORTH (*Vet. Jour.*, 90 (1934), No. 8, pp. 311-322).—The author briefly reviews the present status of the knowledge of infectious abortion and outlines measures that may be taken for its control and eradication.

Further studies of vaccination during calthood to prevent Bang's disease, W. E. COTTON, J. M. BUCK, and H. E. SMITH (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 389-397).—Reporting further upon investigations of vaccination against bovine infectious abortion (E. S. R., 69, p. 427), the details of which are presented in tabular form, the authors are led to conclude that "the vaccination of calves from 4 to 6 mo. of age induces in them an immunity to Bang's disease that, in a high percentage of cases, protects against *Brucella abortus* conjunctival exposure during their first pregnancy and that may be lasting. Agglutination reactions of high titer are commonly caused by the vaccine injections, but the reactions rapidly subside in intensity and give indication of disappearing more regularly than the agglutination reactions induced in more mature, unbred cattle by vaccination. A strain of *B. abortus* of low virulence gives evidence of conferring as much immunity to calves against *B. abortus* conjunctival exposure during their first pregnancy as a strain of pronounced virulence. The immunization results derived from the experiment strongly suggest that the vaccination of calves furnishes a logical plan for dealing with Bang's disease in a class of herds from which the eradication of the malady by the prompt elimination or segregation of reactors is impractical, and at the same time enables stock owners to rear animals with increased resistance to the disease."

The morphology, culture, isolation, and immunity studies of *Actinomyces necrophorus* in calf diphtheria, L. H. SCRIVNER and A. M. LEE (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 360-378, figs. 7).—In investigations conducted at the Wyoming Experiment Station the authors found that the methods described in various publications for isolating *A. necrophorus* in pure culture are not wholly satisfactory. Their studies led to the perfection of a method which is considered satisfactory for isolating the organism from cases of calf diphtheria. Four strains of the organism were isolated in pure culture which always produced lesions in rabbits when injected subcutaneously in sufficient quantities, although the mortality is comparatively low. "The four strains when pooled are pathogenic for calves when inoculated into the submucous tissues or onto scarified areas of the mucous membrane of the mouth. The virulence of pure cultures is much less than that of lesion material containing a mixed bacterial flora when injected into rabbits. The role of secondary invaders may be an important one. Lesions in internal organs of rabbits injected subcutaneously with material containing *A. necrophorus* occur very rarely. Long, beaded filaments of young, actively grow-

ing cultures assume a shorter, thinner appearance as the culture grows older. The organism does not assume coccoid forms. Involution forms are described. Filtrates prepared from pure cultures of the organism do not contain sufficient toxin to affect rabbits when injected subcutaneously or intraperitoneally. The organism does not produce a toxin sufficiently strong to affect calves when filtrates of the organism are injected subcutaneously. The subcutaneous and intraperitoneal injection of filtrate prepared from the four strains of the organism is of questionable value in protecting rabbits and calves from artificial infection with the organism. The subcutaneous injection of a bacterin into rabbits is of questionable benefit against artificial infection with pure cultures of the organism."

Laboratory and field methods for the detection of mastitis, I, II, J. M. ROSELL (*Canad. Pub. Health Jour.*, 25 (1934), Nos. 3, pp. 124-130; 4, pp. 180-184).—This contribution is in continuation of accounts previously noted (E. S. R., 69, p. 274).

Chronic mastitis, G. J. HUCKER and P. A. HANSEN (*New York State Sta. Circ.* 147 (1934), pp. 7, figs. 5).—A practical summary of information dealing with the cause of chronic mastitis, how to detect infected quarters, management of herd to reduce garget, and how to bring mastitis under partial control.

The laboratory examination of milk in the detection and control of mastitis, G. J. HUCKER (*N. Y. State Assoc. Dairy and Milk Insp., Ann. Rpt.*, 6 (1932), pp. 63-75).—A practical contribution from the New York State Experiment Station which reports upon work as above noted.

The microphotography of the living virus of pleuro-pneumonia of cattle, A. W. TURNER (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 4, pp. 299, 300, pl. 1).—Photographs and descriptions of the causal organism or virus of pleuropneumonia of cattle are here presented.

Chlorate poisoning in cattle [trans. title], S. SVENSSON and H. HEDSTRÖM (*Skand. Vet. Tidskr.*, 24 (1934), No. 6, pp. 329-351, figs. 3; *Eng. abs.*, pp. 350, 351).—The lethal dose of sodium chlorate for cattle was found to be about 400 g. Acute poisoning leads to death by suffocation, caused by the formation of methemoglobin in the blood.

Carbon tetrachloride: A note on its toxicity for sheep, D. T. OXER (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 4, pp. 279-284, fig. 1).—The author considers the toxic symptoms as observed in an experimental flock and the effect of carbon tetrachloride on the liver. The results of 4 drenchings of a flock of 118 full-mouth and six-tooth Romney-Southdown ewes in good condition with doses consisting of 2 cc of carbon tetrachloride in 3 cc liquid paraffin are summarized in a table. The appetites of the treated ewes became greatly depressed, the depression appearing at varying periods after treatment, then gradually returning, the period of inappetance tending to increase with each successive administration of the drug. The fact that sheep do not show liver necrosis, as found in the dog, may be explained by the difference in metabolism in the herbivorous, as compared with the carnivorous, animal. Although the actual cause of the symptoms in these sheep is uncertain, it is considered important that such a marked effect on the appetite can be produced and yet only mild symptoms of toxemia result. While carbon tetrachloride is very efficient, it is a therapeutic and not a preventive agent and there are contraindications for its use, of which calcium deficiency is one.

Caseous lymphadenitis: Factors associated with its spread under natural conditions, L. B. BULL and C. G. DICKINSON (*Jour. Council Sci. and Indus. Res. [Aust.]*, 7 (1934), No. 2, pp. 78-86).—The authors have demonstrated the presence of Preisz-Nocard bacilli in the soils from the sheep camping grounds

when the climatic conditions were favorable. They could not be recovered from the same camps after having been subjected to the heat of a South Australian summer or after a severe frosty winter. The bacilli could not be recovered from the soils of the open paddock or from sheep yards or counting-out pens. Treating the soils with sulfur rendered it more acid and consequently less favorable for the continued existence of the Preisz-Nocard bacilli in it. The organisms were also recovered from the feces of sheep infected with caseous lymphadenitis and from those of sheep without lesions of the disease.

Footrot in sheep, D. MURNANE (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 4, pp. 252-259).—This summary of information on foot rot in sheep, based upon work conducted at the Veterinary Research Institute of the University of Melbourne, includes a brief report of experimental work and a discussion of treatment. In the deeper regions of the lesion near the junction of healthy and affected tissues, *Actinomyces necrophorus* appears to be the predominating organism and is often found in almost pure culture. Although found present in practically 100 percent of the cases examined, there is said to be some question as to its being the primary causal agent of foot rot.

Lamb dysentery in North Wales, R. F. MONTGOMERIE and W. T. ROWLANDS (*Vet. Jour.*, 90 (1934), No. 8, pp. 323-337).—Following an introduction in which the literature is briefly reviewed, the authors deal with the toxicity of the intestinal contents of affected lambs, the nature of the toxic element, and the type of *Clostridium* (*Bacillus*) *welchii* isolated from such intestinal contents.

The toxin produced at all periods throughout growth by freshly isolated strains of the lamb dysentery bacillus is neutralized only by the homologous antitoxin. "*B[acillus] paludis* (Wilsdon, type C) antitoxin fails to neutralize except when the test dose during the earlier period of incubation contains only a small number of minimum lethal doses; at later periods it fails entirely. *B. ovitoxicus* (Wilsdon, type D) antitoxin fails to neutralize except when the period of incubation is sufficient to bring about deterioration of the fraction neutralized by *B. paludis* antitoxin. A combination of *B. paludis* and *B. ovitoxicus* antitoxins completely neutralizes the toxin at all periods throughout the growth of the lamb dysentery bacillus. It may, therefore, be said that the toxin of the lamb dysentery bacillus contains two chief toxic fractions—one neutralized by *B. paludis* antitoxin, present in high concentration during the early period of incubation (within 18 hr.) and rapidly deteriorating; the other neutralized by *B. ovitoxicus* antiserum, present in low concentration during the early (up to 2 days) period of incubation, increasing as incubation is prolonged, and relatively stable."

The so-called stiff lambs, H. J. METZGER and W. A. HAGAN (*Cornell Vet.*, 17 (1927), No. 1, pp. 35-44, figs. 3).—A study made by the authors in the sheep raising districts of New York in the spring of 1926 resulted in the discovery that the affection quite well known at that time in certain districts of the State and referred to as stiff lambs is a specific disease with characteristic symptoms and lesions. This condition, which has been recognized in lambs from 2 to 8 weeks of age, is manifested chiefly by a disturbance of locomotion that usually becomes worse until either the animals die or are destroyed by the flock owner. It is due to the muscular changes, the cause of which was not discovered, although apparently not the result of an infection.

The description presented is based upon studies conducted both in the field and laboratory.

An investigation of the cause of the stiff-lamb disease, J. P. WILLMAN, S. A. ASDELL, and P. OLAFSON ([*New York*] *Cornell Sta. Bul.* 603 (1934), pp. 20,

pls. 2, fig. 1).—In experiments conducted during 4 yr. with several lots of ewes of mixed breeding, details of which are presented in tabular form, it was shown that stiff lambs, an early account of which by Metzger and Hagan is noted above, can be produced under experimental conditions. This affection was recorded from Oregon in 1928, since which time it has been reported from Maryland, Michigan, Montana, Nevada, Ohio, Pennsylvania, and Wisconsin.

The authors have found that this condition "can be produced when the ewes are fed a ration consisting of oats, barley, cull beans, and second-cutting alfalfa hay. This ration has been moderately and liberally fed to ewes that were confined to their pens until a few weeks after lambing, and has been liberally fed to ewes that were exercised throughout the winter and spring. No stiff lambs have been produced by ewes which were liberally or moderately fed a ration of oats, wheat bran, corn silage, and mixed hay. The results indicate that neither exercise for the ewes during the winter nor heavy feeding of concentrates is the chief causal factor. The kinds or combinations of feeds seem to have a great influence on the losses that result from the stiff-lamb disease. Creep feeding does not seem to be a factor in the production of the disease."

A list is given of 15 references to the literature.

Investigations as to the importance of serum treatment and bacterin treatment as means of combating *Pasteurella* infection in pigs [trans. title], G. LÖNDBORG (*Skand. Vet. Tidskr.*, 24 (1934), No. 6, pp. 352-379; *Eng. abs.*, pp. 378, 379).—*Pasteurella* serum was found to be of value as a means of combating *Pasteurella* infection and can be employed as a method of protecting healthy, noninfected pigs, but is practically useless in animals already infected. The *Pasteurella* bacterin is of no value as a means of combating the infection. It was found that even with as large a dose as 30 cc serum the protective action does not last long. It was effective 4 days after the serum treatment but had disappeared by the seventh day.

The maternal transmission of vaccinia immunity in swine.—II, The duration of active immunity in the sow and of passive immunity in the young, J. B. NELSON (*Jour. Expt. Med.*, 60 (1934), No. 3, pp. 287-291).—In continuation of the earlier work (E. S. R., 68, p. 532), the author found that "the protective substances produced by vaccinia virus in swine are transmitted repeatedly to the young by way of the colostrum of the sow. In two instances suckling immunity was demonstrable in the young of 6 successive farrowings which numbered 37 and 57 individuals, respectively. The immunity acquired by suckling began to decline during the second month and was practically negligible by the end of the third month. Vaccinia virus introduced cutaneously during the first few days of life in the passively protected pigs exerted little or no immunizing effect."

The hematology of horses hyperimmunized against swine erysipelas [trans. title], S. MALESEK (*Vet. Arhiv.*, 4 (1934), Nos. 6, pp. 281-288; 7, pp. 289-323, pl. 1; *Eng. abs.* pp. 320-323).—A detailed report of studies of the blood of a large series of horses hyperimmunized with *Erysipelothrix rhusiopathiae*.

[Work with avian pathology at the New Jersey Stations], W. C. THOMPSON (*New Jersey Stas. Bien. Rpt.* 1932-33, pp. 69, 70).—This brief report of progress deals particularly with infectious laryngotracheitis.

The cultivation and egg-transmission of the avian tubercle bacillus, H. J. STAFSETH, R. J. BIGGAR, W. W. THOMPSON, and L. NEU (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 342-359).—Following a brief introduction to this contribution from the Michigan Experiment Station, part 1 (pp. 343-349) reports upon the examination of eggs and diseased birds following artificial infection; part 2 (pp. 350-353) upon the examination of naturally infected hens

for evidence of tuberculosis of the reproductive organs; part 3 (pp. 353-355) upon an attempt to show whether eggs from artificially infected hens will produce infected chicks; and part 4 (pp. 355, 356) upon the cultivation of tubercle bacilli on different kinds of media under aerobic conditions and 5, 10, and 15 percent carbon dioxide tension.

Positive tuberculin tests were usually obtained from 4 to 6 weeks following artificial infection. Birds that were infected intramuscularly became sensitized most readily. A few birds, though infected, failed to react.

"Acid-fast granules and otherwise morphologically atypical organisms were found in eggs and reproductive organs of infected hens. Evidence was obtained to suggest that these granules represented stages in the life cycle of the tubercle bacillus. Tubercle bacilli were isolated from 13.96 percent of 93 eggs from artificially infected hens."

It is pointed out that in the investigations of Raebiger¹ in Germany the heaviest percentage of egg infection was found from 10 to 14 days following feeding of tuberculous material to the bird.

The failure by the authors to find organisms before 36 days following artificial infection of the bird is thought to have been due in part to poor production and concurrent disease during the first 4 weeks of the experiment. "Tubercle bacilli were recovered from only 2 of 4 artificially infected eggs. Acid-fast granules were found in eggs in 36 to 57 days following artificial infection of the bird. Cultures of tubercle bacilli were obtained in 35 to 46 days following artificial infection of the birds. The hatchability of the eggs from artificially infected hens was very low, while attempts to prove that chicks may contract tuberculosis from eggs of infected hens were unsuccessful. Gross lesions of tuberculosis in the reproductive organs were found in 3 hens, 2 naturally and 1 artificially infected. Cultures from apparently normal reproductive organs of 9 tuberculous hens yielded cultures of acid-fast organisms. Long's synthetic medium to which were added eggs and brilliant green, gave the most abundant growth of the 5 media used. Petroff's egg medium showed growth in a little shorter time than the rest. A carbon dioxide tension of about 10 percent seemed to promote the growth of tubercle bacilli."

A list is given of 17 references to the literature.

A study of the comparative value of fowl-pox virus and pigeon-pox virus vaccines for immunization against fowl-pox, R. E. LUBBEHUSEN and D. P. EHLERS (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 3, pp. 324-341).—The authors have found in studies in Pennsylvania, here reported in detail, that "pigeon pox virus vaccination does not produce an immunity sufficiently adequate to warrant its exclusive use in the control of fowl pox infection. Pigeon pox virus may be substituted for fowl pox virus as a vaccine when a short interval protection is desired and where the advantages of a less pronounced systemic reaction outweigh the potential hazards of inadequate protection against fowl pox infection. Although its immunizing efficiency is unquestioned, fowl pox virus vaccination has definite limitations. Birds should be vaccinated when the systemic reaction incident thereto is less apt to be followed by undesirable sequelae. On fowl pox infected premises, vaccination of birds between the ages of 30 and 90 days with fowl pox virus vaccine is recommended."

Observations on fowl paralysis (neurolymphomatosis), J. FURTH (*Soc. Expt. Biol. and Med. Proc.*, 31 (1934), No. 8, pp. 921-923, fig. 1).—Two transmissible strains of fowl paralysis virus are reported to have been isolated, 15 successful passages having been made with one strain and 10 passages with the

¹ Beitr. Klinik. Tuberk., 71 (1929), No. 2, pp. 209-215.

other. Inoculations were made in most instances by intravenous injections of blood from paralyzed chickens into healthy young chickens. The transmitting agent circulates in the blood of paralyzed chickens throughout the course of illness as shown by experiment.

"Neurolymphomatosis, unlike all known transmissible strains of leucosis of chickens, does not affect the bone marrow, rarely affects the liver and the spleen, and rarely causes conspicuous alteration in the number of circulating leucocytes. Occasionally the number of lymphocytes in the blood is increased. The highest leucocyte count observed was 140,000, and 92 percent of these cells were lymphocytes, mostly of small size."

The leucocytes of fowl blood with special reference to fowl paralysis, F. BLAKEMORE (*Vet. Rec.*, 14 (1934), No. 16, pp. 417-422, fig. 1).—The details of a study of leucocytes of birds suffering from fowl paralysis are presented, together with the results of examinations of those of normal fowls and pigeons given at length in tabular form. The author's findings and those reported by other workers show that a slightly increased total leucocyte count may be present in cases of this disease. This rise, however, does not appear to be a consistent feature of the disease, "and the fluctuations in the number of leucocytes present in normal fowl blood are in themselves sufficient to make a total leucocyte count valueless for diagnostic purposes. In view of the non-specific variations which occur in the polynuclear cells, it also appears extremely doubtful if any significance can be attributed to the differential percentage leucocyte counts in cases of fowl paralysis without reference to the total leucocyte count."

[**Work with fowl paralysis at the Missouri Poultry Experiment Station,** T. W. NOLAND (In *Missouri State Poultry Association Year Book*, 1933. *Mountain Grove: Missouri State Poultry Assoc.*, [1934], pp. 12, 13).—The results of the experiments conducted led to the belief that paralysis in the fowl is only a symptom growing out of a combination of several direct causes: (1) Worm infestation, (2) chronic coccidiosis, (3) the gizzard worm *C[heilospirura] hamulosa*, (4) incorrect feeding methods and diet, and (5) various tumors, many of which are malignant in nature. In 70 percent of the paralysis cases examined in the laboratory the gizzard worm was found embedded beneath the gizzard mucosa, resulting in an area of necrosis and ulcers and impaired digestion.

An outbreak of fowl plague in New Jersey in 1929, F. R. BEAUDETTE, C. B. HUDSON, and A. H. SAXE (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 1, pp. 83-92).—Contributing from the New Jersey Experiment Stations, the authors report upon work conducted in the course of an outbreak of fowl plague which was detected in three flocks of chickens in Flanders, N. J., in June 1929, and spread through the sale of birds to a flock in Ledgewood and small flocks in Netcong and Kenvil, all in Morris County. The original source of infection could not be determined. The virus was filtered through a Mandler (14-lb.) candle but would not pass a Seitz disk. Two experimentally inoculated birds which recovered from plague gave a serum that was rich in virucidal substance. Virus inoculated intravenously into one of these birds could not be detected 4 hr. later by further inoculation of other fowls. Vesicles on the comb and wattles were observed in birds in which the course of the disease was protracted. Immunity could not be produced by injections of a phenol-glycerin emulsion of liver. Virus could not be detected in recovered birds. Limited attempts to transmit the disease by mosquitoes, mainly *Aedes canadensis*, were negative. The disease was successfully brought under control by slaughter and incineration of all affected and exposed birds.

A list is given of 12 references to the literature.

Fowl typhoid in Kenya Colony, J. R. HUDSON (*Vet. Jour.*, 90 (1934), No. 8, pp. 344-355).—The author reports that vaccination with live attenuated organisms against fowl typhoid, the most important disease of poultry in Kenya, gives good results provided the birds are not exposed to a very heavy infection. The agglutination test was found to be of no value in the detection of birds actually suffering from fowl typhoid, in the detection of carriers, or in assessing immunity.

Relationships between diet and extent of parasitism in bob-white quail, W. O. NAGEL (*Wilson Bul.*, 46 (1934), No. 3, pp. 147-149).—A comparison of diet and parasitism in bobwhite during 1932-33 and 1933-34, under different conditions of diet, has led to the tentative conclusion that the presence of sorghum cane seed in the diet of bobwhite quail has a restraining effect on parasitism.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Idaho Station] (*Idaho Sta. Bul.* 205 (1934), pp. 16-19, 20, 21, 22, 26, 69, 70, 71, figs. 2).—The progress results are presented of studies on alcohol-gasoline blends for internal-combustion engines, the use of Idaho materials for construction purposes, electrical soil heating, use of Diesel tractors, deep tillage implements, efficiency of drainage and irrigation pumping, and rod weeder.

[Agricultural engineering investigations at the Maryland Station], R. L. SELLMAN (*Maryland Sta. Bul.* 362 (1934), pp. 365-368).—The progress results are presented of investigations on the upkeep of farm implements and machinery, and on the corn binder with elevator for harvesting silage corn.

[Agricultural engineering investigations at the New Jersey Stations], E. R. GROSS and W. RUDOLFS (*New Jersey Stas. Bien. Rpt.* 1932-33, pp. 13, 14, 91-94).—The progress results are reported of investigations on ventilation requirements for poultry laying houses, mechanical means of projecting air for dusting, and tillage machinery, and on activated sludge, sludge digestion, trickling filters, sewage chlorination, and boiler corrosion.

[Agricultural engineering investigations at the Vermont Station] (*Vermont Sta. Bul.* 380 (1934), pp. 14, 15, 16).—The progress results are presented of studies of dairy plant efficiency, harvesting immature forage for drying, and operation of a mechanical hay dryer.

Flow of water around bends in pipes, D. L. YARNELL and F. A. NAGLER (*Amer. Soc. Civ. Engin. Proc.*, 60 (1934), No. 6, pp. 783-797, figs. 9).—Studies conducted by the U. S. D. A. Bureau of Agricultural Engineering in cooperation with the University of Iowa are reported. The more outstanding results are presented of a series of experiments on the flow of water around bends of various shapes and various degrees of curvature in 6-in. pipes. The experiments are believed to be unique in that with the same quantity of flow the effect on the loss of head resulting from unequal velocity distribution in the pipe approaching the bend was fully investigated.

The experiments show that it is possible to have conditions such that the resistance to flow may be very small or unusually large in the same pipe bend carrying identical quantities of water. In a standard 90°, 6-in. pipe bend, for the same quantity of flow with high velocity on the inside and low velocity on the outside of the approach pipe the loss of head may be four times as much as would be measured in the same bend when high velocity exists on the outside and low velocity on the inside of the tangent leading to the bend. Present formulas for computing loss of head due to bends appear to apply only to cases in which approximately uniform velocity distribution exists in the ap-

proach pipe. The losses of head in the bends experimented upon appear to vary as the square of the velocity and not as the 2.25 power. A pipe bend may be as useful as any other device for the measurement of discharge. The direction of flow of the secondary currents in pipe bends depends entirely upon the velocity distribution in the approach pipe. The same fundamental laws of flow through bends apply to both closed conduits and open channels.

Seepage of groundwater and its relation to alkali accumulation, D. S. JENNINGS, W. GARDNER, and O. W. ISRAELSEN (*Utah Sta. Circ. 106 (1934), pp. 12, figs. 3*).—A general discussion of the manner of accumulation of alkali in valleys is followed by a brief summary of detailed studies conducted in Cache Valley, Utah. These indicated that pumping of substantial quantities of irrigation water from ground water sources will decrease both evaporation and deposition of salts.

Irrigation of weeds and other noncrop plants costly and unprofitable, O. V. P. STOUT (*U. S. Dept. Agr. Yearbook 1934, pp. 250-253*).—A brief summary is presented of studies conducted by the Bureau of Agricultural Engineering, indicating that in general weeds use more water in proportion to the ground actually occupied than does the general run of crops.

Surface water supply of the United States, 1932, Part 12 B (*U. S. Geol. Survey, Water-Supply Paper 738 (1934), pp. VII+197, fig. 1*).—This report, prepared in cooperation with the States of Idaho, Oregon, Washington, and Wyoming, presents the measurements of flow made on streams in the North Pacific slope basins—Pacific slope basins in the Snake River Basin—during the year ended September 30, 1932.

The industrial utility of public water supplies in the United States, 1932, W. D. COLLINS, W. L. LAMAR, and E. W. LOHR (*U. S. Geol. Survey, Water-Supply Paper 658 (1934), pp. IV+135, pl. 1, fig. 1*).—This report presents analyses showing the composition of the public water supplies at 670 places covering 46 percent of the total population of the United States.

Brief instructions for the design and construction of small dams for emergency conservation work in North Dakota, L. C. TSCHUDY and J. G. SUTTON (*U. S. Dept. Agr., Bur. Agr. Engin., 1934, pp. 24, figs. 13*).—These instructions cover the design and construction of small dams suitable for Civilian Conservation Corps work in North Dakota. The dams to be built are intended primarily to store water for flood control and water-conservation purposes and to raise the water table in bottom lands.

Soil-erosion studies show vegetation has dominant role, H. H. BENNETT (*U. S. Dept. Agr. Yearbook 1934, pp. 322-327, figs. 3*).—Data secured by the Bureau of Chemistry and Soils from various sources are summarized, showing that vegetation in the form of forest or in thick grasslike growth is an inexpensive, permanent cure for erosion. In one form or another it can be used on all kinds of land, on any degree of slope, and under all varieties of climate where there is heat and rain enough to make plants grow.

Terraces effective for controlling erosion on cultivated land, C. E. RAMSER (*U. S. Dept. Agr. Yearbook 1934, pp. 346-348, figs. 3*).—The results of experiments by the Bureau of Agricultural Engineering are briefly summarized indicating the effectiveness of proper terracing in controlling sheet erosion. Terraces are equally effective in controlling and preventing the development of gullies. It has been observed that terracing generally improves fields for the operation of farm machinery by making the ground surface smoother.

Public Roads [July-August 1934] (*U. S. Dept. Agr., Public Roads, 15 (1934), Nos. 5, pp. 109-136+[2], figs. 14; 6, pp. 137-164+[2], figs. 35*).—These numbers of this periodical contain the status of U. S. Public Works road con-

struction as of June 30 and July 31, 1934. No. 5 also contains data on State gasoline taxes, 1933, and an article on Some Aspects of Portland Cement Concrete Pavement Construction, by W. A. Blanchette (pp. 109-131), and No. 6 the following articles: A Study of Oil-Treated Roads in Colorado and Wyoming, by C. A. Carpenter (pp. 137-146); and Power-Shovel Operation in Highway Grading, by T. W. Allen and A. P. Anderson (pp. 147-161).

The use of concrete on the farm, J. C. McCURDY (*N. Y. Agr. Col. (Cornell) Ext. Bul. 285 (1934)*, pp. 28, pl. 1, figs. 26).—Practical information is given.

The strength of screw threads under repeated tension, H. F. MOORE and P. E. HENWOOD (*Ill. Engin. Expt. Sta. Bul. 264 (1934)*, pp. 20, figs. 7).—Tests are reported which were undertaken to obtain data on the behavior under repeated tensile load of $\frac{3}{8}$ -in. studs with three kinds of screw threads, and of $\frac{3}{8}$ -in. studs made from ordinary low-carbon steel and $\frac{3}{8}$ -in. studs made from a heat-treated alloy steel. A comparison was also made of the effective stress concentration at the root of thread, as shown by repeated stress tests to destruction, and the stress concentration as shown by tests of pyralin models examined under polarized light.

Three different lots of metal were used for making the test studs, which were subjected to repeated stress: (1) A plain carbon steel rod containing about 0.30 percent carbon designated as medium carbon steel; (2) a plain carbon steel rod containing about 0.30 percent carbon, and also designated as medium carbon steel, on which threads had been formed by cold rolling along its entire length; and (3) a rod of S. A. E. 2320 steel with a nickel content of about 3.25 percent and a carbon content of about 0.20 percent. The two plain carbon steel rods were tested as received. The 2320 steel was heated to 1500° F., quenched in oil, and drawn at 800°.

The stress-concentration factor for a screw thread is defined as the ratio of maximum stress, which is at the root of the thread, to the average stress over the minimum area of cross section of the thread. This factor may be determined directly by photo-elastic tests. The effective stress-concentration factor is defined as the ratio of the endurance limit of the metal itself to the endurance limit of specimens which fail in the screw threads. The tests taken in connection with previous photo-elastic tests indicate that the stress-concentration factor determined by photo-elastic tests is larger than the effective stress-concentration factor determined by fatigue tests. In other words, determination of stress concentration in screw threads by photo-elastic tests gave results on the safe side as compared with those given by fatigue tests. Both photo-elastic tests and fatigue tests of $\frac{3}{8}$ -in. studs gave higher stress-concentration factors for die-cut U. S. Standard threads than for die-cut Whitworth threads.

Rolled threads on a medium carbon steel rod $\frac{3}{8}$ in. in diameter gave effective stress-concentration factors intermediate between those for die-cut Whitworth threads and those for die-cut U. S. Standard threads, but this superiority over the U. S. Standard die-cut threads may be explained by the fact that the rolled-thread specimens were threaded for the full length, while the die-cut specimens were threaded at the ends only.

For both U. S. Standard threads and Whitworth threads higher effective stress-concentration factors were found for heat-treated nickel steel studs than for medium carbon steel studs. This indicates that the heat-treated nickel steel is more sensitive to stress concentration than is the medium carbon steel, and that a smaller proportion of the tensile strength of the material is available in heat-treated nickel steel bolts and studs subjected to repeated stress than is the case with ordinary structural steel bolts and studs. For heat-treated nickel

steel studs with $\frac{3}{8}$ in. U. S. Standard threads an effective stress-concentration factor of 3.85 was observed. For medium carbon steel this factor was 2.84. These figures suggest that for bolts or studs subjected to repeated tensile stress a safe estimate of the stress at the root of the thread would be, not the nominal value $\frac{P}{A}$ but $\frac{3P}{A}$ for ordinary structural steel, and $\frac{4P}{A}$ for heat-treated alloy steels commonly carried in stock, where P is the load in pounds and A is the area at the root of the thread in square inches.

Congress of Agricultural Machinery (*Congrès de la Machine Agricole, 1933. Compte-Rendu. Paris: Impr. Lang. Blanchong & Co., 1933, pp. 309, figs. 170*).—Brief descriptions are given, with some illustrations of the different machines exhibited. These included soil preparing and harvesting machinery, tractors, agricultural product processing machinery, rural electrification equipment, and internal-combustion engines adapted for agricultural use.

The efficiency of use of farm power, H. R. ROBSON and G. L. SHANKS (*Sci. Agr., 14 (1934), No. 10, pp. 565-586, fig. 1*).—Studies conducted at the University of Manitoba are reported in which a series of 45 drawbar tests were conducted of power machines. The tests made included 10 horse outfits and 35 tractor outfits. Plows, disks, and cultivators were the implements being hauled by horses, while the tractor loads comprised plows, disk tillers, cultivators, and 12 combines. The size of outfits varied from 3- to 8-horse, and the tractors varied in the maximum drawbar horsepower from 8.25 to 33.2 hp.

The results indicate that horse outfits are more likely to be loaded to capacity than are tractor outfits, higher overloads will be found with horse outfits than with tractor outfits, the smaller tractors are more nearly loaded to capacity than the larger tractors, and that as the size of the tractor increases the probability of its being loaded to capacity decreases.

The ease with which the number of horses used may be varied to suit the draft requirements of an implement is an important advantage of horse-operated implements which is not usually stressed. As the draft of any implement varies with soil types, depth, and soil condition, the tractor-operated machine must be of a size that its draft under the worst conditions will not exceed the tractor's capacity. This means that under more favorable conditions the tractor will be underloaded as shown in the tests.

Horses and mules meet need for cheap flexible farm power, studies show, J. O. WILLIAMS and S. R. SPEELMAN (*U. S. Dept. Agr. Yearbook 1934, pp. 244-247, fig. 1*).—A brief summary of farm power survey data obtained in several Middle Western and Middle Southern States is presented, indicating the flexibility and adaptability of various horse and mule hitches, irrespective of the size, shape, or topography of fields, or soil type, and regardless of whether tillage practices call for speedy or slow work.

Flame temperatures in an internal combustion engine measured by spectral line reversal, A. E. HERSHEY and R. F. PATON (*Ill. Engin. Expt. Sta. Bul. 262 (1933), pp. 50, figs. 15*).—The line-reversal method of temperature measurement, as previously applied to the measurement of the temperature of stationary flames, was adapted to measure the flame temperature in an internal-combustion engine. Using an ordinary gasoline and moderate compression pressures, temperatures were measured over a sufficient portion of the operating cycle to determine the maximum flame temperature during combustion for varying air-fuel ratios within the combustion limits. These maximum flame temperatures were compared with those computed for representative air-fuel ratios, considering the effect of residual exhaust gas, variable specific heat, and dissociation, but neglecting heat loss. The effect of spark timing on

the flame temperature was also determined for a limited range of operating conditions.

The results of the investigation indicate that the flame temperature found from a line-reversal measurement is characteristic of thermal equilibrium, established throughout the gases in the engine cylinder early in the process of burning and maintained during the subsequent expansion. The maximum flame temperatures for a compression ratio of 3.86:1 were found to vary from 3750° F. abs., with the richest and leanest air-fuel mixtures, to 4450° with an air-fuel ratio of 13.9:1. The maximum observed flame temperatures and the corresponding calculated temperatures were found to be in closest agreement for the normal operating range of air-fuel ratios between 12:1 and 14:1. Throughout this range the calculated values were approximately 600° higher than the observed values. With either richer or leaner mixtures the difference increased and reached a maximum of 1000° at the lean combustion limit.

Since some of the discrepancy between the calculated and the observed maximum temperatures is undoubtedly due to experimental errors, the most likely of these were considered and their upper limits estimated. If the observed values were increased by these amounts they would still be from 200° to 600° below the calculated temperatures. It would therefore seem probable that this remaining difference is due to an inadequate analysis of the actual combustion process.

The concentrations of the gases in an engine cylinder may be calculated when the temperature and pressure are known, hence the measurement of temperature, independent of the other thermodynamic variables, makes it possible to study the progress of the chemical reactions and equilibrium at high temperatures.

Causes of detonation in petrol and Diesel engines, G. D. BOERLAGE and W. J. D. VAN DYCK (*Inst. Auto. Engin. [London] Jour.*, 2 (1934), No. 7, pp. 11-40, figs. 22).—An extensive technical analysis of detonation in gasoline and Diesel engines is presented, from which the view is advanced that it is correct to look at the phenomena of combustion in Diesel engines and in petrol engines from the same aspect. In both cases the number of collisions of activated reagents is decisive, and self-ignition may be influenced equally by activated oxygen as by activated hydrocarbon. It cannot be overlooked that in the petrol engine unstable peroxide-like compounds formed early during the compression stroke may have some influence. Their effect will at most produce an effect on the main phenomenon of auto-ignition of the end gas under Diesel conditions. Detonation or "pink" may occur in any class of engine and is a vibration in the air charge due to a local rapid pressure rise. As such it is most commonly met in a pinking petrol engine, but it occurs also in Diesel engines. On the other hand, "knock" indicates mechanical vibration, mainly of walls, due to a rapid pressure rise, and is inherent to the petrol pink as well as, in many cases, to the Diesel process. The term "bumpy running" may be reserved finally for those cases where heavy engine parts, i. e., crank shaft, are set in vibration.

Alcohol-gasoline engine fuels, H. MILLER (*Idaho Sta. Bul.* 204 (1934), pp. 29, figs. 12).—Field and laboratory tests to compare gasoline and gasoline-alcohol mixtures in internal-combustion engines are reported, together with the results of a survey of practices in foreign countries relative to the use and production of alcohol and its byproducts.

The three methods of using ethyl alcohol with gasoline as engine fuel tested included blending absolute ethyl alcohol with gasoline; blending commercial

ethyl alcohol with gasoline through the use of blending agents, such as propyl, butyl, and amyl alcohols, benzol, or acetone; and using a double-bowl carburetor and mixing the two fuels in the vapor phase. Compression ratios of 5.5:1 and 6.35:1 were used.

In a four-cylinder engine a blend of 10 percent absolute alcohol and 90 percent gasoline gave performance practically identical with gasoline. It did not, however, knock at the heavier loads as did gasoline. In the blend containing 20 percent commercial alcohol the performance of the gasoline was superior at the loads less than 5 hp., while at the higher loads the reverse was true.

The carburetor on the same engine was modified in order to burn a lower purity of alcohol.

In using 10 percent alcohol of 95 percent purity the performance of the mixture at the lower compression ratio was inferior to that of gasoline at all loads. At the higher compression ratio the performance of the mixture was superior at loads greater than 4 hp.

Similar tests were conducted with the 5.5:1 compression ratio for similar proportions of alcohol of 90 and 85 percent purity. The increased amount of water in the alcohol did not affect the performance materially.

Road tests were also conducted with the same engine. The car was driven over a distance of 300 miles for each test to eliminate as far as possible the error due to normal variations in the road conditions. Tests were made with the standard cylinder head giving a compression ratio of 4.22:1 and with a special head giving a compression ratio of 5.5:1. At the lower compression ratio on the road, as well as in the laboratory, the performance of gasoline was superior to the mixture. The grade of gasoline used in the first test could not be used with the higher compression ratio due to detonation. At the higher compression the performance of the blend was superior to the premium gasoline by 6.15 percent. The premium gasoline knocked readily during moderate acceleration. The blend could not be forced to knock. Consequently the compression ratio could have been raised considerably and the mileage increased still further.

It is concluded that the successful use of ethyl alcohol as an engine fuel and antidetonant depends on the compression ratio of the engine.

Belts and pulleys, W. C. KRUEGER (*N. J. Agr. Col. Ext. Bul. 126 (1934)*, pp. 13, figs. 11).—Desirable practices and data pertaining to the use of belts and pulleys on the farm are briefly presented.

Tractor repair and maintenance, R. I. SHAWL (*Illinois Sta. Circ. 425 (1934)*, pp. 48, figs. 28).—The purpose of this circular is to supplement the information given in the instruction books on the repair and maintenance of tractors. It contains a large amount of information on tractor repair and overhaul and includes a classified list of items which should be considered in that connection.

Corn and soybean production, H. T. BARR (*Louisiana Sta. Bul. 253 (1934)*, pp. 4).—Practical information is given on methods and mechanical equipment used in corn and soybean production, including seed-bed preparation, planting, cultivation, harvesting, and use of the pulverator. A labor and power summary is included.

Thresher and other mechanical injury to seed beans of the lima type, R. BAINER and H. A. BORTHWICK (*California Sta. Bul. 580 (1934)*, pp. 30, figs. 13).—Studies are reported which showed that peripheral velocity of the thresher cylinder is a more satisfactory basis than speed of rotation for comparing the effects of cylinders having different diameters and operating at different speeds.

Cylinder speed and percentage of damage are directly related—the greater the speed the greater the damage. Total damage to a lot of baby lima beans containing 9.1 percent moisture varied from 7.6 to 52.5 percent at threshing speeds of from 770 to 1,560 ft. per minute. A lot of baby lima beans containing 16.4 percent moisture showed 1.0 and 21.0 percent damage, respectively, at cylinder speeds of 770 and 1,785 ft. per minute. High moisture content in the beans permits higher cylinder speeds to be used without an increase in the total damage. The cylinder speeds required to produce 15.0 percent total damage in Fordhook beans containing 15.9, 17.3, and 18.8 percent moisture were 1,150, 1,330, and 1,600 ft. per minute, respectively. A thresher having only one cylinder is not suitable for seed beans because the speed necessary for thoroughness is too high for the production of damage-free seed. A low speed on the first cylinder of a 2- or 3-cylinder machine usually insures the threshing of a high percentage of the crop with a minimum of damage. If speed on successive cylinders is increased the threshing can be completed without damaging a high percentage of the seed.

More damage apparently occurs during light feeding of the threshing machine than during ordinary or heavy feeding. For example, the total damage to Fordhook beans containing 14.6 percent moisture amounted to 11.4, 8.6, and 7.4 percent, respectively, for light, ordinary, and heavy feeding. Fordhook beans carefully threshed with the ordinary disk harrow set straight showed only 1.2 percent total damage. The total damage to four lots of baby lima beans threshed by rolling varied from 2.6 to 38.1 percent.

According to laboratory tests in which beans of various moisture contents were subjected to impacts of equal intensity by dropping them known distances, beans of high moisture content receive less damage than beans of low moisture content. The results agree with those obtained from threshing tests in the field. Moisture content is of fundamental importance in the threshing of seed beans. Although uncontrollable, it is nevertheless an important guide in determining how high a cylinder speed may be used with safety.

The fast moving cup-type elevators and the steep slides found in bean warehouses are the most likely points where damage to seed beans during handling may occur. Beans of 10.6 percent moisture content rolled down a 45° slide showed total damage of approximately 4.5, 8.6, and 15.3 percent, respectively, for slide distances of 6.4, 10.5, and 15.0 ft. Comparative tests showed that neither the plate nor the pick-up type of planter produces any appreciable amount of damage.

Potato losses in handling reduced by simple equipment, A. D. EDGAR (*U. S. Dept. Agr. Yearbook 1934, pp. 292–296, figs. 3*).—A brief summary of the results of experiments conducted by the Bureau of Agricultural Engineering is presented, indicating that mechanical diggers cause fewer injuries to potatoes than digging by hand.

Digger injuries can be reduced by running the continuous-elevator type of digger low at the rear end, and by padding the tines and projections of the shaker-elevator type of digger. Picking potatoes into baskets of the split-wood variety causes less injury than picking them into metal baskets.

The average grader injury of about 2 percent may be reduced by padding ramps between runs of conveyor belt and grading chain and such corners as the moving potatoes might hit. Keeping the grader in adjustment and repair is equally important in preventing grader injury.

In all steps in the handling, it has been found that the temperature of the potatoes affects the amount of injury suffered. If the potatoes have a temperature of 50° F. or above, appreciably less bruising results than when they are

handled at lower temperatures. In a storage house one bin may be warmed without affecting the others by blowing warm air from the main alley into the conveyor or trench of the bin to be warmed.

Machinery for dusting cotton, R. C. GAINES and D. A. ISLER (*U. S. Dept. Agr., Farmers' Bul. 1729 (1934), pp. 11+14, figs. 11*).—This supersedes Farmers' Bulletin 1319 (E. S. R., 49, p. 590). It gives practical information on the selection of cotton dusting machinery best suited to the needs and conditions of individual farms.

The New Jersey multiple unit laying house and bill of material, E. R. GROSS and H. E. BESLEY (*New Jersey Stas. Circ. 318 (1934), pp. 15, figs. 3*).—Summarized and itemized bills of materials are given for this structure, together with suggestions on construction and plan and elevation drawings.

The bin method of mixing feed, H. BERESFORD and F. W. ATKESON (*Idaho Sta. Bul. 203 (1934), pp. 16, figs. 10*).—The information contained in this bulletin has been noted from another source (E. S. R., 71, p. 713).

Storage for the farm home, M. FITZGERALD and C. V. PHAGAN (*Okla. Agr. Col. Ext. Circ. 312 (1934), pp. 12, figs. 13*).—Practical information and working drawings are given for fruit, vegetable, fuel, tool, and other types of storages.

Pollution of wells and its prevention, W. RUDOLFS (*N. J. Agr. Col. Ext. Bul. 127 (1934), pp. 8, figs. 2*).—Practical information is given on the manner in which wells become polluted, the character of the polluting material, and methods for the prevention of pollution. Water treatment by heat and chemical disinfection also is briefly described.

Purification of creamery waste on filters at two Iowa creameries, W. E. GALLIGAN and M. LEVINE (*Iowa Engin. Expt. Sta. Bul. 115 (1934), pp. 39, figs. 10*).—The designs of the plants for the treatment of wastes from two Iowa creameries are described, and the results of studies made to improve their performance are reported to indicate the procedure necessary to meet adequately the requirements of specific cases.

Effect of bottom ventilation on purification by an experimental trickling filter, M. LEVINE and H. E. GORESLINE (*Iowa Engin. Expt. Sta. Bul. 116 (1934), pp. 16, figs. 2*).—Studies are reported on treating skim milk solutions on a small trickling filter constructed to permit either thorough natural bottom ventilation or complete elimination of bottom ventilation.

The two filters employed in the experiments were 2 ft. square, 6 ft. deep, and constructed of galvanized sheet iron. Two-ft. lengths of 1-in. galvanized iron pipes laid across the bottom of the filter with approximately 1-in. spaces between them served as supports for the filling material, which consisted of about 6 in. of quartzite (2- to 3-in. size) placed directly on the pipes, 5 ft. of carefully washed clinkers ($\frac{5}{8}$ to 2 in. in size), and for the upper 6 in. extra coarse clinkers (2- to 4-in. masses), employed with a view to reducing the washing effect on the surface of the filter while dosing. The skim milk waste was applied at a rate of approximately 840,000 gal. per acre per day for about 14 hr. daily, the rate of dosing on a 24-hour basis thus being approximately 500,000 gal. per acre. The long rest period (8 to 10 hr.) closely simulated the conditions in small creameries. The dosing cycle was about 4 min.

The experiments show definitely that elimination of bottom ventilation resulted in severe clogging of the filters and a rapid decrease in their purifying efficiency. This was indicated by a marked reduction in nitrates, increases in ammonia, organic nitrogen, and acidity, and a marked rise in the biochemical oxygen demand of the effluent.

With the filling material employed and the high concentration of the waste applied, bottom ventilation was indispensable to efficient functioning in spite

of the daily rest period. Neither washing nor chlorinating the filters improved the effluent as long as the bottoms remained closed. Opening the filter bottoms, permitting access of air, resulted in improvement which was markedly accelerated by washing out accumulated clogging material.

AGRICULTURAL ECONOMICS

[**Agricultural economics studies by the U. S. Department of Agriculture**] (*U. S. Dept. Agr. Yearbook 1934*, pp. 130-140, 170-174, 247-250, 253-255, 262-265, 275-282, 344-346, 358-360, 369-373, figs. 6).—In addition to the articles noted on pages 123 and 126, the following general articles are included: **Agricultural Adjustment Act Rests on Working of Established Economic Law**, by M. Ezekiel and L. H. Bean (pp. 130-140); **Country Banking in Need of Fundamental Change in Methods**, by F. L. Garlock (pp. 170-174); **Index Data on Prices Paid by Farmers Are now Collected Weekly**, by R. F. Hale (pp. 247-250); **Land Prices in the East and South as Shown by Government Purchases**, by P. J. Paxton (pp. 253-255); **Marketing Agreements on Various Crops Increase Returns to the Growers**, by E. W. Braun (pp. 262-265); **Pattern of Real Estate Values Less Changed than Level of Values**, by B. R. Stauber (pp. 275-282); **Tax Relief for Farmer Touches Public-Finance Problem as a Whole**, by B. W. Allin (pp. 344-346); **Truck-Crops Index Constructed with 13 Products Included**, by A. G. Peterson (pp. 358-360); and **Wheat-Production-Control Program Wins Farmer Support**, by C. C. Conser (pp. 369-373).

[**Investigations in agricultural economics at the Kentucky Station, 1933**] (*Kentucky Sta. Rpt. 1933*, pt. 1, pp. 8-20, 47, 48, 49-51, 52).—Some findings are reported in studies made of taxation of farm real estate, of farm taxes and county government in two rural counties with relatively little taxable property, of the utilization and classification of land in the mountain area of eastern Kentucky, of 770 entire businesses and 439 individual enterprises in the most important agricultural areas of the State, of prices of Kentucky farm products, 1910-32, of tobacco prices and seasonal movements of such prices, of the distribution of tobacco by groups of grades, of geographical variation in tobacco production, of tobacco disappearance, of marketing milk, of the cost of producing milk and butterfat, of the factors influencing cost and returns for 13 herds of hogs in Union County, of the economics of hog production in the State, and of the cost and profit margin in producing lambs on 28 Owen County farms.

[**Ownership and utilization of Idaho land**] (*Idaho Sta. Bul. 205 (1934)*, pp. 14-16, figs. 2).—Maps show, by counties, the lands in national forests, public domain, Indian reservations, and State and private ownership, and the types of farming followed.

Methods used in an economic study of land utilization in Tompkins County, New York, and in other similar studies in New York, A. B. LEWIS ([*New York*] *Cornell Sta. Mem. 160 (1934)*, pp. 57, figs. 6).—This publication describes and discusses the methods used in Bulletin 590, previously noted (E. S. R., 71, p. 867), and the improvements and adjustments in the methods used in later similar studies in the State. It also describes the purpose of such economic studies of land utilization, the previous studies of the station leading up to the general land survey of New York, and the legislation of the State concerning reforestation. In the Tompkins County study the lands were divided into five classes, chiefly on three principal types of information—condition of buildings, use of land, and character of soil. Comparisons of the different land classes were made with respect to size of business, income from farming, assessed values, tax delinquency, farm fire insurance and losses, outdoor

relief to the poor, and cost of education in rural schools. Suggestions are also offered for indicating farm-to-market roads, extent of rural electrification, and rural residential areas in the different land classes.

Trends in agriculture in Washington, 1900 to 1930.—Types of farming series, II, N. W. JOHNSON and R. E. WILLARD (*Washington Sta. Bul. 300* (1934), pp. 45, figs. 28).—This is the second bulletin of the series previously noted (E. S. R., 70, p. 697). Charts and maps are included and discussed showing the growth of urban and rural population, the trends in size of farms, and in production of field crops, vegetable crops, tree fruits, small fruits, dairy cattle, beef cattle, hogs, horses and mules, sheep, and poultry. The significant trends in agriculture in the western, central, and eastern sections of the State are summarized.

Community production of Acala cotton in New Mexico, A. R. LEDING (*U. S. Dept. Agr. Circ. 314* (1934), pp. 24, figs. 3).—This circular describes the development of one-variety cotton communities in the Mesilla Valley and, to a lesser extent, in several other localities of New Mexico where somewhat specialized conditions prevail and where cotton is a comparatively new crop.

The destination of Iowa's commercial corn, R. C. BENTLEY (*Iowa Sta. Bul. 318* (1934), pp. 64, figs. 15).—The material on volume of shipments of corn presented in Bulletin 252, previously noted (E. S. R., 59, p. 885), is brought down to date. Data regarding carload shipments and receipts of corn and oats from every railroad station in the State, and data regarding destinations of shipments were obtained from the railroads of the State for the period 1923-24 to 1930-31, inclusive. These data are analyzed, and tables, charts, and maps presented and discussed showing the volume of production and shipments from the State; the production, shipments, and receipts by types of farming areas and years; the average percentage of corn production shipped on first billings by counties; the relative importance of different markets; the market destinations, by years, of shipments of corn from Iowa's primary markets; the seasonal movements from the State as a whole and from the different types of farming areas, and to the different types of markets on first billings, and from Iowa's primary markets; and the destination each year 1927-28 to 1930-31 of corn from each of four counties representative of different marketing areas of the State.

For the period the first billings of corn ranged from 10.7 to 19.2 percent, averaging 15.2 percent, of the total production. The average percentages shipped from different types of farming areas were: Western cash 28.3, western feeding 10.2, northern cash 28.5, central cash 31.9, central feeding 10.8, eastern feeding 4.2, dairy 0.4, and southern pasture 2.6. Three-fourths of the yearly average of over 63 million bu. of commercial corn originated in 35 of the 99 counties. Over 50 percent of it left the State on first billing, of which 42 percent went direct to terminal markets. Of the reshipments from Iowa's primary markets 85 percent went outside the State, 23 percent going to terminal markets. Quantity and quality of corn production in neighboring States were the most important factors in determining the direction of shipments. Two peaks in shipments occurred, one from December to February, and a second more uncertain one any time after midsummer. The percentage of the commercial corn to be shipped which moved in the winter increased from the eastern to the western part of the State. Individual terminal markets were found to have rather definite territories in the State. The volume going to such markets varied markedly from year to year, the larger terminals showing the greater changes.

The economics of certified seed potato production.—I, The seed potato enterprise, J. A. HITCHCOCK (*Vermont Sta. Bul.* 370 (1934), pp. 36, figs. 9).—The development of the certified seed potato industry, certification standards, the Vermont seed potato industry, the factors affecting changes in acreage inspected, and continuation of growers in the enterprise, are described and discussed, using 359 potato enterprise records for the years 1928 to 1930, inclusive, secured by the survey method from a total of 218 farms. Analysis is made of the chief items of cost in growing and harvesting potatoes with a view to determining the conditions and methods of management which make for success.

Correlation of the inspected acreage with the average purchasing power of potatoes the second calendar year preceding gave a gross coefficient of 0.762. "On the average each ten-point change in purchasing power was followed the second season thereafter by a change, in the same direction, of 42 acres in the area inspected." Change in the number of growers was found to be responsible for approximately 95 percent of the variance in the total acreage from 1921 to 1933, and acreage per grower approximately 5 percent.

The average cost per acre of growing and harvesting potatoes was \$158 in 1928, \$156 in 1929, and \$171 in 1930, and the average yields in the respective years were 210, 245, and 310 bu. per acre. "The increase in 1930 was due almost entirely to an increase in the expenditure for seed, the only item whose yearly averages changed materially during the period covered." The distribution of costs (average for the three years) was, labor 28 percent, fertilizer 18, seed 17, power 12, spraying and dusting 7, and machinery cost, land charge, and miscellaneous costs each 6 percent.

A study of the cost of handling citrus fruit from the tree to the car in Florida, H. G. HAMILTON and M. A. BROOKER (*Florida Sta. Bul.* 266 (1934), pp. 72, figs. 20).—This study, made for the purpose of revising Bulletin 202, previously noted (*E. S. R.*, 61, p. 782), is based upon data covering cost of operation during the 1931-32 season of 125 packing houses which handled 68.8 percent of the commercial production of the State. Tables show for the packing houses studied, with comparisons for the houses covered in the previous report for the 1924-25 and 1925-26 seasons, the volume of grapefruit, oranges, and tangerines packed and the disposition of each kind of fruit, the fixed investment, by items, and the costs per box, by items, of handling packed citrus fruit. The various costs in 1931-32 and the variation of costs in different sections of the State are discussed.

The data for 1931-32 are analyzed to determine the influence of cost of handling citrus fruit, of volume of fruit per packing house and per patron, investment per packing house, per box, and per car capacity of packing house, the volume handled per car capacity of packing house, relation of type of construction to investment in buildings and land, size of packing house based on daily car capacity, days plant was operated and use of house while operating, percentage of fruit represented by grapefruit, owned and rented plants, arrangement of packing houses and equipment, one-unit and two-unit houses, and miles that fruit was hauled to packing plant. Analysis is also made of the cost of coloring and precooling citrus fruit. Some of the findings were:

The percentage of bulk fruit of total volume increased from 2.9 and 3.6 percent, respectively, for the seasons 1924-25 and 1925-26 to 21.1 for the season 1931-32. Cost per box of handling citrus fruit from the tree to the car, exclusive of precooling, averaged 93.1 ct. in 1924-25, \$1.02 in 1925-26, and 75.9 ct. in 1931-32. The greatest reductions in costs were for labor and materials. Overhead costs increased, due to higher investments. Total costs per box in

1931-32 averaged from 58 ct. to \$1.56. Little difference in cost was found between different sections of the State. Total cost for handling in 1931-32 averaged 67.2 ct. per box in 14 plants with volumes of more than 200,000 boxes, as compared with \$1.14 per box in 10 plants with volumes of 25,000 boxes or less. For packing houses of approximately equal volume, cost of handling fruit increased rapidly with increasing investment per plant. Investment per box exerted a striking influence on the cost of handling fruit. The influence on costs of handling of large volume per car capacity of plant was more important than that of large volume per packing plant. Number of days plant was operated during the packing season and percentage use made of house while operating were important factors influencing costs. The cost of coloring averaged 3.3 ct. per box in 44 plants, and precooling 8.5 ct. per box in 37 plants in 1931-32.

The study leads to the conclusion that on the average for economical operation of a packing house a volume of 60,000 to 70,000 boxes, a minimum volume of 15,000 to 20,000 boxes per car capacity, and an investment of not more than \$15,000 per car capacity are necessary.

Marketing cantaloups and other muskmelons, J. W. PARK (*U. S. Dept. Agr. Tech. Bul. 425 (1934), pp. 51, figs. 20*).—Tables and maps included and discussed present data as to acreage and production, shipments, shipping seasons, market outlets, and prices for different States and districts. Marketing methods, market information, and competition with other fruits and melons are discussed. Information regarding harvesting, packing, grading, loading, precooling, inspecting, etc., is given.

Handbook of United States standards for grading and marketing fresh fruits and vegetables (*U. S. Dept. Agr., Misc. Pub. 190 (1934), pp. IV+168*).—Included are the standards recommended by the Bureau of Agricultural Economics, U. S. D. A., for use in grading and marketing fresh fruits and vegetables.

Improving the domestic market for lard, R. SCHICKELE and T. W. SCHULTZ (*Iowa Sta. Bul. 319 (1934), pp. 65-84, figs. 8*).—This is an abridgment of certain phases of the technical and economic analyses in Research Bulletin 171 previously noted (*E. S. R., 71, p. 411*). It discusses the U. S. consumption of lard and lard substitutes, the lack of lard standardization and the reasons therefor, and the physical characteristics and price relations of lard and lard substitutes. Suggestions are made as to means of improving the competitive position of lard.

The lard market at home and abroad, R. SCHICKELE and T. W. SCHULTZ (*Iowa Sta. Bul. 320 (1934), pp. 85-104, figs. 5*).—This bulletin is an abridgment of certain phases of Research Bulletin 171 previously noted (*E. S. R., 71, p. 411*). It discusses the competition lard is facing from vegetable oils, and the foreign trade and tariff situation affecting the lard market.

Fats and oils: Statistics of United States production, trade, and consumption, 1912-1933 (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. 92, fig. 1*).—Included are statistics on cash income from farm production of selected products used in the manufacture of fats and oils, disappearance, exports, imports, stocks, etc., of, and tariff rates on, fats and oils, feeds, lard substitutes, linseed oil, oleomargarine, paint, soap, etc. Other tables show production, trade, stocks, and disappearance for individual commodities.

The edible fat problem in Germany, H. E. REED (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F. S. 61 (1934), pp. [21+17]*).—The supplies of fats other than lard, the objectives and operation of the neutral lard plan, and the importance of the hog industry in Germany are described.

The feed purchasing power of a hen's egg production, H. L. KEMPSTER (*Missouri Sta. Bul. 337 (1934), pp. 19, figs. 6*).—Tables and charts show, by months, January 1910 to December 1933, inclusive, the prices paid Missouri farmers for corn, wheat, oats, and eggs; the farm prices of poultry feed (a mixture of 5 lb. of corn, 3 lb. of wheat, and 3 lb. of oats); and the pounds of feed that the production of a 122-egg hen would purchase. The poultry conditions, 1866–1909 and 1910–34, and the possibilities in poultry keeping are discussed briefly with tables and charts showing, by years 1910–33, the income over feed costs in terms of pounds of feed and dollars from a hen averaging 122 eggs per year and the egg-feed ratio.

Egg-feed ratio, C. C. HAMPSON and R. E. WILLARD (*Washington Sta. Bul. 297 (1934), pp. 15, figs. 3*).—Tables and charts show, by months, January 1922 to April 1934, inclusive, (1) for eggs and poultry feed, the weighted average wholesale prices at Seattle, and the index numbers (base, 1923 to 1932=100) unadjusted and adjusted for seasonal variations; (2) the ratio of egg prices to feed prices; (3) index numbers of the egg-feed ratio unadjusted and adjusted for seasonal variations; and (4) the weights used in computing the composite weighted average prices of eggs. The feed and egg prices used and the methods of weighting these prices in computing the index numbers are discussed.

Market movements of Ohio eggs, L. G. FOSTER and F. E. DAVIS (*Ohio Sta. Bul. 536 (1934), pp. 29, figs. 4*).—This study is confined to the marketing of eggs through the large assemblers located in various parts of the State. Data were secured directly from the records of 46 private dealers and 5 farmer-owned cooperative marketing associations. The place of the poultry enterprise as a source of gross farm income in the United States and in Ohio, the relation of total population and egg production in the different geographic sections of the United States, the monthly variations in total receipts of eggs and receipts from Ohio at Boston, New York, and Philadelphia, variation of cold-storage holdings of eggs in different years and months, etc., are described. Analysis is made of the estimated surplus or deficit production of eggs in Ohio, by counties, in 1929, and of the basis of buying prices, transportation practices, and market outlets for Ohio eggs. The present channels by which eggs move from producing districts in Ohio and the types of business of country dealers are described.

The poultry industry in Ohio is the third most important source of income from agricultural products and contributed 13 percent of such income in 1927 and 16 percent in 1932. The estimated deficit of production under egg consumption in the State for 1929 was 11.3 percent. There was a surplus in production only in the months of May, June, July, and August. Of the 88 counties in the State, 18 showed a deficit from March to August, and 33 from September to February. New York City quotations on eggs are widely followed by Ohio dealers as a basis of buying prices during the season of flush production. Cleveland, Pittsburgh, and Cincinnati prices were used when New York City prices were not followed. Cleveland, New York City, Boston, and Pittsburgh were the destinations of 60.7, 61.5, and 69.8 percent, respectively, of the eggs shipped by Ohio dealers in the three years 1929–30 to 1931–32, inclusive. Cleveland and New York City received 31.5, 35.2, and 52 percent, respectively, of such eggs. Approximately 60 percent of the eggs shipped went to destinations outside the State. Approximately 60 to 70 percent of the eggs shipped by dealers were moved by freight, 20 to 25 percent by truck, and 7 to 20 percent by express. The proportions shipped by the different methods varied considerably in the different seasons.

Studies in Vermont dairy farming.—VIII, Orleans, St. Albans, Randolph and Richmond areas, S. W. WILLIAMS (*Vermont Sta. Bul.* 376 (1934), pp. 35, figs. 4).—Continuing this series (E. S. R., 66, p. 783), farm business records were obtained from 52 farmers selling milk in Orleans, 59 in St. Albans, 34 in Randolph, and 59 in Richmond, covering the year ended April 30, 1932, a year in which farming was unprofitable because of relatively low milk prices. The areas and economic conditions are described, analyzed, and discussed.

Labor incomes on the 204 farms varied from \$1,616 to —\$3,678. Those on 104 of the farms were between —\$1 and —\$600, and those on only 39 farms were positive. Despite considerable advantage due to greater efficiency in production, large farms returned decidedly poorer labor incomes than did small farms. The possession of dairy herds with milk production above the average resulted in labor incomes above the average, but the advantage was apparently less than usual. Relatively low prices of livestock products increased the need for economical methods in obtaining high yields. In the three districts where the basic rating plan was operative, it was found profitable to produce a relatively high proportion of the milk in the fall months. Winter dairying, while not definitely unprofitable, failed to give conclusively better returns. On the whole, better than average incomes were obtained on the farms obtaining an appreciable portion of receipts from sources other than cattle. Rates of investment and the level of miscellaneous expenditures affected labor incomes materially. Increases in labor efficiency were associated with striking improvements in labor incomes, despite the fact that they were accompanied by increases in volume of business. Labor incomes were more closely correlated with accomplishments per dollar than with accomplishments per man. A combination of high rates of production, efficiency in the use of labor and capital, and economy in miscellaneous expenditures was most effective in meeting the adverse economic conditions existing during the period.

Agricultural adjustment measured in progress toward parity prices, L. H. BEAN and A. P. CHEW (*U. S. Dept. Agr. Yearbook* 1934, pp. 101–130, figs. 28).—Charts included and discussed show the relation between the index numbers of wholesale prices of all commodities and the prices of farm products in the United States, 1798–1933; of prices received and prices paid by farmers, 1915–33; of income of industrial workers and urban consumers, 1919–33; of prices of industrial stocks and commodities, interest rates, and industrial production, 1919–33; of factory pay rolls and cash income from all farm products, grains and cotton, and meat animals, dairy products, and poultry products, 1924–33; of prices of six speculative commodities in the United States and the London price of gold in dollars and sterling, April 1933 to March 1934; and the parity prices (index of prices paid by farmers), January 1931 to March 1934, and farm prices of cotton, cottonseed, wheat, corn, hay, oats, flaxseed, hogs, butter, cattle, lambs, wool, chickens, horses, potatoes, sweetpotatoes, beans, eggs, apples, and flue-cured tobacco, and of the prices received for milk sold to distributors and prices received by farmers for milk sold to consumers.

The incidence of the cost of the AAA corn-hog program, G. SHEPHERD (*Jour. Farm Econ.*, 16 (1934), No. 3, pp. 417–430, figs. 3).—This is a statistical analysis made at the Iowa Experiment Station with a view to determining who provides the additional income that is to flow to farmers as a group under the hog-processing tax. In summing up the author states that “it seems, then, that (1) as far as the incidence of the processing tax is concerned, farmers ‘pay the processing tax’ themselves, in the sense that the price they receive for hogs is \$2.25 per hundred lower than if no tax were being applied, but they are being reimbursed by benefit payments from the Federal Government arising

from the collection of the tax; (2) consumers will not pay the processing tax, but will bear a large part of the incidence of the effect of the reduction in hog production; they will receive, say, 20 percent less pork while paying out as much money as they used to pay for a full amount of pork; and (3) packers will take a smaller total volume of margin from the 'consumer's pork dollar' than before, even though their margin per pound may be increased, because of the reduced volume of pork they will handle. As a result, therefore, it appears that farmers will receive more gross money income, for raising less hogs, than before the program was put into effect; and their profits should be substantially increased."

Prospects for agricultural recovery, VII-VIII (*Iowa Sta. Buls.* 316 (1934), pp. 161-198; 317, pp. 201-223, figs. 4).—These bulletins supplement the series on the agricultural emergency in Iowa previously noted (*E. S. R.*, 71, p. 408).

Part 7, requirements for economic plans affecting agriculture, by J. A. Hopkins, Jr., discusses 12 of the important requirements that should be met by any economic plan affecting agriculture. Part 8, who pays for the hog reduction program, by G. Shepherd, deals with the questions as to who pays the processing tax on hogs and who suffers from the reduced production and therefore consumption of hogs under the hog reduction program. The bulletin is based on the statistical analysis noted above.

Michigan farm prices and costs, 1910-1934, O. ULREY (*Michigan Sta. Tech. Bul.* 139 (1934), pp. 99, figs. 27).—The purpose of this study was "to construct index numbers which present a statistical price history of Michigan farm products since 1910, and to analyze the factors which have affected the prices of farm products and farm costs." Tables show, by months January 1910 to May 1934 (1) the prices paid producers in Michigan and index numbers of such prices for wheat, rye, buckwheat, beans, potatoes, sugar beets (seasonal price only), apples, corn, oats, barley, hay, beef cattle, veal calves, hogs, sheep and lambs, wool, horses, chickens, eggs, milk, and butter; (2) the index numbers of cash crops, feed crops, meat animals and wool, dairy products, and poultry products; and (3) the weighted aggregative index of the 20 products listed above (sugar beets and horses not included).

Among other tables and charts are ones showing the purchasing power of different products for different years and the relation between Michigan farm prices and prices paid by farmers for commodities purchased, farm wages, farm taxes, farm mortgage interest charges, farm real estate value, total farm investment, farm costs, and farm income.

The types of price movements affecting agriculture, the general price level and the prices of farm products in the United States and in Michigan, food prices and distribution costs, the seasonal variations in prices and marketings of Michigan farm products, and the economic position of Michigan agriculture since 1920 are discussed.

New York market prices of certain New Jersey vegetables, 1910-1933, A. G. WALLER and J. W. CAENECROSS (*New Jersey Stat. Bul.* 575 (1934), pp. 12, fig. 1).—Tables show the monthly average central market prices for savoy cabbage, cauliflower, celery, celeriac, dandelion greens, escarole, horseradish, kale, kohlrabi, leeks, parsley (curly), parsnips, radishes, rhubarb, romaine (lettuce), scallions, string beans (round), and string beans (wax).

North Carolina farm prices of cotton in relation to grade and staple length, J. G. KNAPP and S. L. CLEMENT (*North Carolina Sta. Bul.* 289 (1934), pp. 63, figs. 12).—Samples were obtained at the time of ginning from bales of cotton at from 5 to 8 local markets during the periods October 1 to December

20, 1928, 1929, and 1930. These samples were classified by the Federal Cotton Classification Office at Atlanta, and the prices paid for the bales obtained from the local buyers. Analysis is made of the data to determine to what extent the prices paid farmers reflect grade and staple length variations, in how far average local prices are a measure of marketing efficiency, the relation between average quality of cotton sold at a local market and the prices paid, and the relation of round lot prices to quality. Efforts made in the State to improve farmers' marketing ability are described.

The average premiums or discounts in the local markets for Strict Middling $\frac{7}{8}$ -in. white cotton over Middling $\frac{7}{8}$ -in. white cotton ranged from a discount of -0.4 points to $+52.8$ points, average $+27$ points, in 1928; from $+3.7$ to $+44.4$ points, average $+17.5$ points, in 1929; and from -4.2 to $+27.6$ points, average $+4$ points, in 1930. The average central market premiums were 17, 30.6, and 30 points in the respective years. The premiums or discounts for Strict Low Middling $\frac{7}{8}$ -in. white cotton were: 1928 local markets -0.6 to -55.7 , average -20.8 ; central markets -80 ; 1929 local markets $+0.8$ to -35.8 , average -16.6 ; central markets -76.7 ; and 1930 local markets -5.4 to -39.2 , average -17.6 ; central markets -67.7 . The average premiums or discounts for $\frac{1}{8}$ -in. white cotton based on $\frac{7}{8}$ -in. white cotton were: 1928 local markets -0.5 to $+12.3$, average $+3.4$; central markets $+28.5$; 1929 local markets -4.1 to $+32.2$, average $+9.6$; central markets $+42.6$; and 1930 local markets -0.2 to $+18.7$, average $+8.5$; central markets $+37.8$. Those for $\frac{3}{8}$ -in. cotton were: 1928 local markets -7.5 to $+6.4$, average -0.5 ; central markets -50 ; 1929 local markets -6.6 to $+6.3$, average -0.9 ; central markets -121.9 ; and 1930 local markets -3.8 to $+10.1$, average -2.9 ; central markets -100 . In general, no definite tendency was found for premiums or discounts to be greater or less in the local markets which paid higher or lower prices for the basis grade and staple length. Grade valuations were more closely related to variations in local market prices than were staple valuations, the coefficients of determination being 0.5693 for grade and 0.1545 for staple length. Although local prices did not reflect grade and staple length differences in prices, a definite tendency was found for local buyers to pay in accordance with the general grade and staple value of the cotton sold.

Appendixes discuss the methods used in studying local prices, premiums and discounts, the variability of farm cotton prices, and transportation costs as a factor in local cotton prices.

Reliability and adequacy of South Dakota farm price data, J. MUEHL-BEIER (*South Dakota Sta. Bul.* 286 (1934), pp. 48, figs. 2).—The purpose of this study was to determine the reliability and adequacy of the South Dakota farm price data regarding the more important agricultural products collected by the Division of Crop and Livestock Estimates of the Bureau of Agricultural Economics, U. S. D. A. The records analyzed cover the years 1927 to 1932, inclusive. Data for two months for the calendar years 1928, 1930, and 1932 were studied for each commodity. Illustrations of size of samples were selected from the other years. A special farm price inquiry was conducted to obtain the August 15 and September 15, 1932, prices with a view to determining whether there was any difference in the reliability of price samples from selected vocational groups as compared with those from the regular reporters. Seasonal variation in reliability of the data was observed by analysis of the price samples for 1932. The effect of stratification was determined by analysis of the samples from the different crop-reporting districts for 1930. Prices of a few commodities in surplus-producing areas were also analyzed to determine their reliability.

The author states that using the standard of accuracy desired by the Division of Crop and Livestock Estimates—a relative probable error not to exceed 0.5 percent for all important farm commodities and not to exceed 2.5 percent for less important commodities—"the price data covering the years 1927 to 1930 are reliable enough for practical purposes even though there were cases that did not meet the desired standard of accuracy. The reliability of the price data in 1931 and 1932, expressed in a relative measure, is found to fall short of the desired standard, but before these data are considered as unreliable the following factor should be considered.

"When the reliability of the sample data is measured by an absolute measure of reliability as probable error, rather than by a relative term such as relative probable error, there is comparable reliability from year to year, except for some degree of unreliability introduced in 1931 and 1932 by a slight decrease in size of price samples in those years. This can be explained by the fact that this absolute measure does not relate the probable error to the average price existing at the time as does the relative measure of reliability. The low prices in 1931 and 1932 caused a high coefficient of variation and a high relative probable error, because these measures are standard deviation and probable error expressed as a percentage of the low average price. Standard deviation cannot decrease in proportion to the price decline because freight differentials, etc., cause price variations; therefore this should not in itself be interpreted as an indication of unreliability due to improper sampling."

It is indicated that a standard of accuracy expressed in terms of the relative probable error and computed for a period of high prices cannot be used as a measure of reliability of price data for a low price level period. No evidence of bias on the part of regular reporters was detected in the comparison of different types of reporters. The only seasonal factor affecting reliability was the fact that fewer reports were obtained during certain periods. In most of the price samples 6 or 7 of the 9 crop-reporting districts had coefficients of variation lower than the sample for the State, indicating that in these districts stratification had been accomplished. Considerable spread was found between the surplus-producing area and the average State price of the same commodity.

Crops and Markets, [July 1934] (*U. S. Dept. Agr., Crops and Markets, 11 (1934), No. 7, pp. 217-272, figs. 3*).—Included are tables, charts, reports, summaries, etc., of the usual types covering crop and livestock estimates, market reports, and the price situation of agricultural products. The financial results for 1933, reported by 6,855 owner-operators, are analyzed and discussed, with tables showing for the United States as a whole and for each geographic division (1) the size and value of farms, value of farm personalty, receipts by sources, cash outlay by items, interest paid, inventory changes, and expenditures for improvements; and (2) the percentages of the farmers obtaining results within specified ranges. Comparisons are made with the years 1925 to 1932, inclusive. A series of tables show, by States, for 1931, 1932, and 1933 (preliminary), the farm prices (except for livestock), farm value, gross income, and cash income from corn, barley, wheat, buckwheat, oats, rye, all hay, sweet sorghum forage, pop corn, cattle and calves, hogs, sheep and lambs, chickens, eggs, and milk.

Agricultural statistics (*U. S. Dept. Agr. Yearbook 1934, pp. 383-766*).—This section is prepared under the direction of the statistical committee of the Bureau of Agricultural Economics. It "brings together what seem from experience to be the most important agricultural statistics for the United States, and for the world so far as the agriculture of this country is concerned. Historical and geographical series have been given. Most of the data for earlier years, not covered in this Yearbook, will be found in past issues." (*E. S. R., 69, p. 744.*)

Statistics are given for different grains, cotton, sugar, tobacco, different fruits and vegetables, miscellaneous crops, beef cattle, hogs, sheep, horses, mules, dairy cattle, poultry, and livestock, dairy, and poultry products; foreign trade in agricultural products; farm business, including tables covering, among other items, agricultural capital, gross income, expenditures, farm population, costs of production, indexes of farm prices and of prices paid by farmers, index of prices of farm real estate, farm wages, farm real-estate taxes, farm-mortgage debt, and findings in cost of living studies; and miscellaneous items, including meteorological data. Four summary tables are included indicating in a general way some of the results of the 1933 cotton, cigar-leaf tobacco, and wheat acreage reduction campaigns of the Agricultural Adjustment Administration and the marketing agreements entered into during 1933 through that Administration.

RURAL SOCIOLOGY

Farm versus village living in Utah, J. A. GEDDES (*Utah Sta. Bul.* 249 (1934), pp. 70, figs. 14).—Conditioning factors deemed essential to an understanding of present-day communal problems of Plain City, Utah, are (1) historical events indicating social movements, (2) the people themselves, (3) the land base, (4) the climate, (5) the water supply for irrigation, (6) culinary water, (7) the means of communication, and (8) the community traditional and social heritage. These factors are developed in the text of part 1 of the bulletin.

Part 2 discusses housing conditions, including the adequacy of the house, the number and kind of rooms, heating and lighting, running water and kitchen sink, porches, types of architecture, home grounds, and other things concerning the age, condition, construction, cost, and conveniences of the home.

While inferior to village farm homes, farm-dweller homes are better than the nonfarm homes. "Ecological forces in Plain City operating in the field of housing have placed nonfarm homes at the bottom of the heap; just above them are the farm-dweller homes; higher still, with a considerable margin of difference, are the village farm homes; slightly higher yet are the edge-of-town homes. These relative positions are determined by the houses themselves, by improvements of home grounds, and by conveniences within the homes."

Planning a subsistence homestead, W. W. WILCOX (*U. S. Dept. Agr., Farmers' Bul.* 1733 (1934), pp. II+20, figs. 5).—This deals "chiefly with the economic problems that will be met by those people who are planning to combine part-time farming and wage earning." The selection of land near cities; vegetable, poultry, fruit, feed, and livestock production on small acreages; the possibilities of a small wood lot; the limitations of small acreages as a means of self-support; and the production primarily for home use on large acreages, are discussed.

The recreational uses of land in Connecticut, N. L. WHETTEN and V. A. RAPPORT (*[Connecticut] Storrs Sta. Bul.* 194 (1934), pp. 80, figs. 14).—Urbanization has proceeded at a rapid rate in Connecticut for nearly a century. By 1890, 52.6 percent of the population lived in urban communities. This increased to 59.9 percent in 1900, 65.6 percent in 1910, and 70.4 percent in 1930. The density of population increased from 155 persons per square mile in 1890 to 333 in 1930.

The process of urbanization has brought with it the need for the recreational use of land. Factors leading to this use are (1) the reduction in the number of working hours and the resultant increase of leisure time, (2) the

rise of financial surpluses beyond the mere necessities of life, and (3) the close proximity of Connecticut to New York and other large centers of population.

This report sets forth the importance of recreation as a use for land and describes certain phases of its sociological significance, among which are summer residences, recreational clubs, municipal and town parks, athletic fields and playgrounds, State parks and forests, semirecreational property, and the acreages and values of recreational property compared with farm property.

Changed economic conditions may have their effect upon the recreational use of land. People unable to maintain city homes may move out to their summer homes and commute. The recreational element, therefore, may tend to disappear and eventually affect the social organization of rural areas unless regional planning is resorted to. The situation constitutes "a challenge to the adequacy of local institutions."

Mobility of rural families.—I, Changes in residence and in occupation of rural husbands and wives in Genesee County, New York, W. A. ANDERSON ([*New York*] *Cornell Sta. Bul.* 607 (1934), pp. 32, figs. 7).—This study presents the data for the changes in residence and occupation of the husbands and wives in approximately 2,500 families residing in the open-country areas of Genesee County in 1930.

Genesee County as a whole may be considered a farming county, although it is tending to become more and more influenced by urban conditions. The total population was 44,468 persons in 1930, of which 21,849 resided in incorporated places of 2,500 or more as its urban population. The total rural population included 22,619 persons, of which 12,094 were farm inhabitants, 3,765 lived in incorporated villages of less than 2,500 inhabitants, and 6,760 resided in unincorporated villages and other rural nonfarm territory.

In the families studied, 85 of every 100 husbands and wives were born in the United States. Of the native Americans, 88 percent were born in New York State and 4 percent in a State bordering upon New York. Of all the husbands and wives in all the families studied, both native and foreign, 75 of every 100 had lived their whole lives within the borders of New York State, and 69 of every 100 had lived their whole lives within a territory of 80 by 60 miles. Of all the husbands, 80 percent, and of all the wives, 71 percent, were born on a farm and in 1930 still lived on a farm. Among the husbands, 85 percent of the farm owners were born on farms; 81, 73, and 69 percent, respectively, of the farm tenants, farm laborers, and rural nonfarmers were farm-born. Among the wives, 75 percent of those in farm-owner and farm-tenant homes were born on farms; 60 and 61 percent, respectively, of those in the farm-laborer and rural-nonfarmer homes were born on farms.

Of 1,874 of these families, 55 percent had never lived in a village or city. Those who did move from the open country went, in the main, to live in a city, for 34 percent had lived in a city, 9 percent in a village, and 2 percent in both places.

Of 2,337 of these open-country families, in 1,452 both husband and wife were born on a farm. In an additional 27 percent of the families either the husband or the wife was born on a farm.

Of 2,560 fathers who recorded their occupation at the time of the survey, 78 percent were farming. The remainder consisted chiefly of skilled craftsmen and unskilled laborers.

The main conclusion drawn from this study is that underlying the social life of rural Genesee County is a stable population centered in its farm-operating families. Upon this population can be built the secure foundation of organized community life, social organizations, and economic cooperation. These families are constituted mainly of native husbands and wives reared on farms in the

immediate vicinity of their present homes. Their interests are centered in the farms and communities where they live, and these families furnish the materials for direction into larger social activities.

Occupational mobility among farmers.—I, Mobility patterns, B. O. WILLIAMS (*South Carolina Sta. Bul. 296 (1934), pp. 91, figs. 26*).—The purpose of this study is to analyze social mobility among people engaged in the farming occupation of Pickens County, S. C., and to ascertain the relationships between mobility and certain socio-economic factors.

This analysis suggests that excessive moving among farmers is disastrous to their social and economic well-being. Neither is excessive moving of farm people good for the rural community. Those who have moved the most have accumulated the least and have been of least value to their respective communities. There is hardly an exception to the fact that those farmers who have done the best, according to the indexes used in this study, have moved the least.

A study of rural community development in Waterville, New York, W. G. MATHER, JR., T. H. TOWNSEND, and D. SANDERSON ([*New York*] *Cornell Sta. Bul. 608 (1934), pp. 39, figs. 27*).—Waterville, with a population of 1,298 in 1930, lies at the approximate center and is 12 miles southwest of Utica, a city of more than 100,000. The community embraces the most of two townships of Oneida County, Sangerfield and Marshall; the village lies mainly in Sangerfield.

The social evolution of the community is dealt with in two parts. Part 1 covers the period beginning about 1792 and ending in 1900; part 2, the period extending from 1900 to 1933.

The lesson drawn from the Waterville community is this: "Men came to the great hollow in the hills looking for homes and clustered in the best sites that nature had provided for them; intermarriage reinforced proximity; they became self-conscious neighborhoods. Then hop culture came into the area, dominated the lives of all, reached across the neighborhood boundaries, and tied them together in town association. When the hop industry failed, dairying and cash crops took its place; the automobile and the hard road at once brought them together in a community with Waterville village as its center, and exposed the new community to the influences of the modern world. All of these factors were, in large measure, beyond control; world forces influenced them, resistance was vain, and they adjusted themselves as best they could, like iron under the blows of a blind blacksmith. The cumulative effect has been to create a common hope, a common need, a common center of interest—unsought, and for that very reason all the stronger—known as the Waterville community."

Rural organization contacts in three Kentucky communities, F. BOYD, M. OYLER, and W. D. NICHOLLS (*Kentucky Sta. Bul. 350 (1934), pp. 111-140*).—In this study records were taken covering 158 households consisting of 780 persons and comprising three communities—Parksville, Athens, and Hebron.

Data presented showed contacts by age and sex groups, contacts of persons living in rented or owned houses, contacts outside the community, and religious contacts. For the 719 white persons 5 years of age or above, "90.7 percent of the reported 48,964 organization contacts were religious. . . . Fifty-nine percent had contacts with or attended meetings of religious organizations only."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the forty-seventh annual convention of the Association of Land-Grant Colleges and Universities, edited by C. A. McCUE (*Assoc. Land-Grant Colls. and Univs. Proc., 47 (1933), pp. 298*).—This is the usual report

of the convention (E. S. R., 69, p. 746) held at Chicago, Ill., November 13-15, 1933, and previously discussed (E. S. R., 70, pp. 1, 145). Included are the papers and discussions thereon presented in the general sessions of the association, in the general sessions and subsections of resident teaching, experiment station work, and extension work of the section on agriculture, and in the sections on engineering and home economics. The reports of committees, the minutes of the executive body, etc., are also included.

First problems in agriculture, R. A. BALLINGER ET AL. (*New York: Amer. Book Co., 1934, pp. XI+468, pls. 2, figs. 253*).—This is a textbook for seventh- and eighth-grade pupils, using material furnished by the several departments of the Oklahoma Agricultural and Mechanical College. "The organization of the subject matter is a combination of the topical and job-analysis method."

FOODS—HUMAN NUTRITION

The thirty-eighth report on food products and the twenty-sixth report on drug products, 1933, E. M. BAILEY ET AL. (*Connecticut [New Haven] Sta. Bul. 363 (1934), pp. 655-712+LIX*).—In addition to the routine analyses of foods and drugs, this annual report (E. S. R., 70, p. 271) contains several special articles as follows:

Beer, W. T. Mathis and E. M. Bailey (pp. 660-676).—This article describes the ingredients, manufacture, types, and standards of beer and its general composition, and gives data on the composition of early beers and those of 1933, on the content of protein and phosphoric acid in malt liquors, and on the ash constituents of malt beer and nonmalt beer, together with routine analyses of samples of malt beverages taken before and after repeal.

Ice cream, D. C. Walden, H. C. Yale, O. L. Nolan, and E. M. Bailey (pp. 679-689).—This is chiefly a discussion of the revision of the State statutes relating to ice cream, particularly a new provision for the control of overrun requiring that in no case shall any ice cream contain less than 1.6 lb. of fat solids per gallon. The results of the inspection of 150 samples of ice cream examined for the dairy and food commissioner and 13 for individuals are discussed, chiefly from the standpoint of overrun.

Repeal whisky, C. E. Shepard and E. M. Bailey (pp. 703-707).—This is a brief discussion of the interpretation of analyses of whisky in terms of the Government regulations in effect before prohibition.

Among the miscellaneous routine analyses reported is one of a sample of table sirup derived from squash. The sirup contained about 64 percent of carbohydrates, including dextrin, and about 72 percent of total food solids. In general composition it resembled other common food sirups, such as molasses, sorghum sirup, etc.

Thermal properties of meat, J. H. AWBERY and E. GRIFFITHS (*Jour. Soc. Chem. Indus., Trans., 52 (1933), No. 40, pp. 326T-328T, figs. 2*).—A method of determining the specific heat of beef over a temperature ranging from -80° to -180° C. by the transfer of a thin copper cylinder packed with the meat from immersion in a powder of solid CO_2 to liquid oxygen is described, with data obtained on several samples of powdered dried beef of varying moisture content and one sample of fresh beef. Data were also obtained on the specific heat of three of the samples in temperature ranges of 48° to 18° , using a water calorimeter.

The specific heat at the temperatures below freezing ranged from 0.17 to 0.26 gram-calorie per gram per degree and at the higher temperatures from 0.36 to 0.5 gram-calorie per gram per degree.

Determinations were also made of the thermal conductivity of a sample of fresh beef at low temperature, using the hot-plate method, with an average for six determinations of 0.0038 gram-calorie per second per square meter for a gradient of 1° per centimeter.

The thermal diffusivity or "quantity which governs the rate of approach to a steady regime when thermal conditions are altered" was calculated from the theoretical formula $\text{diffusivity} = (\text{conductivity}) / (\text{specific heat per unit volume})$ and checked by direct measurements from cooling and heating curves.

Shrinkage and heat penetration during the roasting of lamb and mutton as influenced by carcass grade, ripening period, and cooking method, L. M. ALEXANDER and N. G. CLARK (*U. S. Dept. Agr., Tech. Bul. 440* (1934), pp. 27, figs. 2).—"This bulletin represents an initial attempt to supply much needed information on the factors that influence shrinkage and rate of heat penetration during roasting. It presents data on 7 different methods of roasting 1,185 legs of lamb and mutton, ranging in grade from Choice to Cull, and in ripening period from 2 to 24 days after slaughter. Included also are chemical analyses of 30 legs of lamb from Choice to Cull grade carcasses contributed by the Animal Husbandry Division of the Bureau of Animal Industry. Without attempting refined correlation methods, these data were used as a basis for estimating what shrinkage may reasonably be expected and how much time to allow for roasting leg of lamb or mutton of a given grade and a certain ripening period when using a particular method."

The higher the grade of lamb and mutton the greater was the shrinkage. It is pointed out, however, that this does not mean that in the higher grades there was necessarily a greater loss of nutritive matter, for the pan drippings are usually used for gravies and sauces, and the excess fat in the drippings would probably not have been eaten even if retained by the roast. The water loss by evaporation during roasting did not follow grade consistently. The Choice, Good, and Medium grades cooked more rapidly in proportion to their weight than did the Common or Cull grades.

With increased ripening period after slaughter, the shrinkage on cooking and the roasting time decreased, thus offsetting to some extent the loss of weight in the cooler during storage.

In the comparison of oven temperature variations as influencing shrinkage, the shrinkage at a constant temperature of 125° C. was about 4 percent less than at a combination of searing at 265° for 20 min. and finishing at 125°. On the other hand, the shrinkage at a constant temperature of 175° was about 4 percent higher than at the combined searing and finishing temperatures. Attention is called to the fact that the average temperature of the combination of searing at 265° and finishing at 125° is higher than 125° but lower than 175°. "The significance of these results lies in the fact that it is the average oven temperature which has more influence on shrinkage than does the initial sear.

"As a whole the studies show that the lower the oven temperature the smaller was the shrinkage of the leg of lamb cooked to the medium-to-well-done stage (76°). At the lowest oven temperature used, constant 125°, the shrinkage averaged 12 percent and the cooking time 45 min. per pound. When lamb legs were first seared, and then finished at different oven temperatures, at the lowest finishing temperature, 125°, the meat shrank 13 percent, while at the highest, 175°, the shrinkage averaged 17 percent. The cooking time ranged from an average of 36 to an average of 24 min. per pound, respectively.

"In contrast when leg of lamb was cooked well done (83°) by these same oven temperatures, 125° and 175° following searing, the shrinkage was not

significantly different, averaging 27 percent. The cooking time averaged 60 min. per pound by the former method and 25 by the latter. Without doubt the time influenced the shrinkage.

"These tests on the influence of cooking method showed that the stage to which leg of lamb was cooked made more difference on the shrinkage than the oven temperature that was chosen. The results bring out an important point in meat cookery with respect to controlling shrinkage: The stage of doneness to which meat is cooked in roasting may make more difference on the shrinkage than the specific oven temperature used. This is a good argument for the use of a roast-meat thermometer in addition to an oven thermometer, because the meat thermometer shows when the desired stage of doneness is reached and prevents overcooking and excessive shrinkage."

Press fluid from heated beef muscle, A. M. CHILD and M. BALDELLI (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 12, pp. 1127-1134, figs. 4).—In this contribution from the Minnesota Experiment Station an apparatus called a pressometer, which has been developed to press the fluid from cooked meat, is described and illustrated, the preliminary steps leading up to the standardization of methods for using the apparatus are discussed, and the methods finally adopted for its use in determining the amount of press fluid in roasted beef muscle and the ratio of press fluid to dry matter, and in obtaining press fluid in sufficient quantity for chemical analysis are outlined. The press fluid is defined as the "moisture plus the soluble material plus the colloidal fraction that is pressed from muscle by the pressometer."

The use of the apparatus is illustrated by data on the press fluid in two kinds of beef muscle, one tender and one less tender, and on the moisture, ether extract, and nitrogen in the press fluid from roasted adductor muscle when the samples were kept under pressure for 5 and 20 min., respectively.

The content of press fluid in the tender and less tender muscles of beef was found not to vary significantly when the grams of press fluid per gram of dry matter were compared. The content of ether extract and moisture in the press fluid from the adductor muscle did not vary significantly with the time during which the meat samples were under pressure, but the values for nitrogen were significantly higher in the press juice obtained in 5 min. than in the sample obtained in 20 min.

The nutritive value of green immature soybeans, C. D. MILLER and R. C. ROBBINS (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 2, pp. 161-167, figs. 3).—In this investigation at the Hawaii Experiment Station, two varieties of green immature soybeans were analyzed for proximate and mineral composition, one in the raw state and both after cooking by the method commonly used in Hawaii. The cooked beans were also used for determinations of vitamin content. The seeds of one of the varieties analyzed, both raw and cooked, described as Seaweed, F. P. I. No. 80483, were obtained through W. J. Morse, of the U. S. Department of Agriculture, from Japan, where they are said to be used only in the green state. The other was a local unknown variety. The method of cooking consisted in boiling the beans in the pods in salted water from 15 to 25 min., after which the beans slip out easily from the pods.

The data on the composition of the cooked unknown variety and the cooked and raw samples of the named variety are as follows: Moisture, 64.2, 63.5, and 69.1 percent, respectively; protein, 15, 13.8, and 12.5 percent; ether extract, 2.7, 4.2, and 5.1 percent; crude fiber, 1.6, 1.5, and 1.5 percent; ash, 2.9, 3.1, and 1.8 percent; carbohydrates (by difference), 13.6, 13.9, and 10 percent; calcium, 0.1, 0.098, and 0.063 percent; phosphorus, 0.257, 0.286, and 0.239 percent; and iron, 0.00213, 0.00344, and 0.00283 percent, respectively. These data, in comparison

with other vegetables, indicate relatively high percentages of protein, fat, calcium, phosphorus, and iron.

The cooked beans were considered to be a very good source of vitamins A, B, and G and a poor source of vitamin C. In the A tests growth at a unit rate was not established, but 10 rats gained an average of 59 g in 8 weeks when fed 0.25 g of the cooked green beans daily (except Sunday) and 11 rats an average of 95 g in 8 weeks when fed daily supplements of 0.5 g. In the vitamin B (B₁) tests 8 rats fed daily supplements of 1 g gave an average of 22 g and 7 rats fed 1.38 g daily an average of 31 g in 8 weeks. In the vitamin G tests, with tikitiki as the source of vitamin B, 7 rats fed 2 g daily gained an average of 48 g and 12 rats fed 1.5 g daily an average of 43 g in 8 weeks. The results were somewhat erratic in the C tests, but 12 g daily were required to protect the animals from gross scurvy.

The authors conclude that cooked immature green soybeans constitute a vegetable of great nutritive value in the oriental diet, and that the people of other countries might well add them to their diet.

Sesame seeds have high nutritive value; very rich in calcium, C. CHATFIELD (*U. S. Dept. Agr. Yearbook 1934*, pp. 316, 317).—Attention is called in this contribution from the Bureau of Home Economics to the exceptionally high nutritive value of the sesame seed (*Sesamum orientale*), particularly in regard to calcium. The seeds are also rich in protein of a good quality, in fat, and in phosphorus. Three types of the seed grown in Arizona and analyzed in the Department contained an average of about 1 percent of calcium and 0.7 percent of phosphorus on an air-dry basis. Much of the calcium, however, is located in the seed coat, which is removed in the ordinary process of preparing the seed for human consumption. Analysis of a single sample of the decorticated seed gave a value of only 0.08 percent of calcium and 0.68 percent of phosphorus. Laboratory nutrition tests and cooking tests have demonstrated the effectiveness of whole sesame seed as a source of calcium and the feasibility of using it in muffins, cookies, breads, cakes, and confections.

Maturity of canned peas, V. B. BONNEY and J. I. PATMORE (*Canning Age*, 15 (1934), No. 8, pp. 361-363, 383).—In this contribution from the U. S. D. A. Food and Drug Administration, data are presented showing that in canned peas the content of water-insoluble solids is a good index of maturity. "Samples of peas of both Alaska and sweet varieties were collected and canned in five sections of the country. Of 70 samples classed as immature, 62 showed water-insoluble solids less than 20 percent, 6 between 20 and 21, and 2 between 21 and 22. Of 11 classed as nearly mature, 1 showed insoluble solids below 20, 2 between 20 and 21, 5 between 21 and 22, and 3 over 22 percent. Of 29 samples classed as mature, 1 showed insoluble solids below 20, 1 between 21 and 22, and 27 over 22 percent."

Effect of light on bottled juices, D. C. CARPENTER (*Indus. and Engin. Chem.*, 25 (1933), No. 8, pp. 932-934, figs. 3).—In this investigation at the New York State Experiment Station, apple juice prepared and processed by the method of Carpenter and Walsh (*E. S. R.*, 68, p. 443) and bottled in clear glass bottles and sauerkraut juice prepared in the same way were placed in light-tight boxes provided on the sloping fronts with light filters of red, orange, yellow, green, deep blue, and green and blue. The boxes were placed side by side on a window ledge with southern exposure to sunlight on May 10, 1932, and removed on October 24. Check samples without protection from the light and others completely protected by black paper were likewise exposed. On completion of the exposure the colors of the juices were determined in a colorimeter, the turbidity nephelometrically, and the flavor and aroma by organoleptic tests.

The red end of the spectrum tended to darken and the opposite end to fade the color of the apple juice. The color of the juice exposed to light through the green filter was practically the same as that of the juice completely protected from light. The aroma of the apple juice exposed to light through orange and yellow filters was pronounced even better than that of the juice protected from light or exposed to light through yellow and green filters, while the aroma of the juices not protected from light or exposed through green-blue and blue filters was pronounced very poor, as was the flavor, which was good in all of the other samples.

The kraut juice kept in the dark was superior in every respect to the other samples. Only fair results were obtained with the green filter, which produced the best results of any of the filters for the apple juice.

The author suggests that beverage juice manufacturers should bear in mind the protective influence of green filters on light deterioration, and market fruit juices either in green glass bottles or in clear glass bottles wrapped in transparent green cellulose coverings.

Diet studies show needs that national planning must consider, H. K. STIEBELING (*U. S. Dept. Agr. Yearbook 1934*, pp. 185-188).—This contribution from the Bureau of Home Economics is a brief discussion of some of the material in Circular 296 (E. S. R., 70, p. 416).

The contribution of the nursery school to the health needs of the pre-school child, C. A. WILSON (*Med. and Prof. Woman's Jour.*, 41 (1934), No. 2, pp. 55-59).—A large part of this discussion by the staff physician of the Merrill-Palmer Nursery School, Detroit, Mich., is devoted to the value of the nursery school in overcoming faulty and preserving good food habits.

Standing heights of school children as determined by two techniques, J. WHITACRE (*Amer. Jour. Phys. Anthropol.*, 18 (1934), No. 3, pp. 457-465).—The two technics compared in the measurement of a large number of school children in the investigation at the Texas Experiment Station (E. S. R., 71, p. 878) varied only that in one the child stood on a rigid support with his back against the measuring scale on which a sliding horizontal wood square was moved down until it pressed against the skull, while in the other the child stood on the weighing scale and did not touch the measuring scale. The sliding head bar was adjusted as before. Data obtained by two observers for the same child and the same observers for the same child on successive days indicate that more accurate results can be secured when the child is required to stand erect against a measuring board than free on the weighing scale.

Supplementary mid-morning feeding of rural school children, B. WAIT, O. MERRIAM, and M. V. COWING (*Massachusetts Sta. Bul.* 310 (1934), pp. 47, figs. 7).—This is the final report of an investigation organized and begun by E. Davies and completed by the present authors (E. S. R., 71, p. 563). The study was conducted in four consolidated rural schools located in different parts of the State and involved 760 children (386 girls and 374 boys), of whom 230 were observed over a 2-year period and 106 for 3 yr. Schools A and B were small schools in a rural farming community mostly of old New England stock. School C was in a rural industrial village, the population of which was largely foreign born, and school D in a neighboring village of the same town, the population of which was largely of native New England stock. The lunches consisted of tomato concentrate in schools A and B, pasteurized milk in school A, evaporated milk in schools C and D, and evaporated milk and tomato concentrate in schools A and D in different seasons.

The observations included medical and dental examinations, records of school progress, illnesses and absences, and the customary height and weight

measurements. In the final evaluation of the nutritional status all of the observations were carefully examined by the senior author and one or the other of the junior authors, and two ratings were made for each child. The first, described as qualitative nutritional condition, consisted of an evaluation of the child's condition irrespective of his weight and based largely on the medical records. The second, described as general nutritional condition, consisted of an evaluation of the general nutritional status from all of the data, both qualitative and quantitative.

A statistical analysis of the results obtained in the various ratings of nutritional status showed the highest correlation between the two types of ratings described above, the coefficient of correlation being 0.93 ± 0.003 . Next highest was the correlation between the evaluations of the nutritionist and the physician. The correlations between the general nutritional condition and the amount of subcutaneous tissue, deviations from the Baldwin-Wood scale, and deviations from the Lucas-Pryor standards were much lower, and those between the qualitative nutritional condition and each of the above factors still lower. The coefficients of correlation were likewise low between any two of the quantitative ratings of nutritional status.

The data are presented and discussed at considerable length under the headings changes in general nutritional condition of the children during the experimental period, results of the feeding as indicated by the medical examination, and influence of the mid-morning lunch on growth, school attendance, and colds, school progress, and dental caries. The general conclusions are essentially as follows:

All of the supplementary feeding produced some, though not marked, favorable effects on the general nutritional condition of a majority of the children. Milk alone, either pasteurized or evaporated, was somewhat more effective than tomato alone, but the mixture of evaporated milk and tomato juice appeared to be more effective than either one alone.

As judged by the medical records, definite, though not marked, improvement was shown in the condition of the children receiving milk in either form and but little, if any, change in the children receiving tomato juice. The improvement in the children receiving milk "was most evident in posture, color of mucous lining of the mouth, tonsils, glands, and skin color. None was apparent in the lungs, subcutaneous tissue, or muscle tone. Correlations indicate that a significant relationship existed between nutritional condition and muscle tone, skin color, lungs, subcutaneous tissue, posture, glands, tonsils, and color of mucous membrane, in the order given."

The lunch had no significant effect on growth in height or on the incidence of dental caries. The data were inconclusive concerning the effect on school absences due to illness or on the incidence or duration of colds. There was some evidence, though not entirely conclusive, of a favorable effect of the lunch on school progress among children in the lower grades. Improvement was noted in some of the children who were in good condition as well as those who were in fair or poor condition at the beginning of the experiment. The greater percentage increases in weight were found in the older children, although age had no apparent influence on the extent of improvement shown in the medical records.

In conclusion the authors state that the fact that "some improvement could be detected in the greater majority of the children as the result of giving but one cup of milk or even less of tomato juice as a mid-morning lunch, is a severe commentary on the home diets of the children. As there is no reason to think the dietary habits of the families in these communities were better

or worse than those in many other villages, such findings justify the contention that the diets of the average family are very often more or less limited in some respects. Just what the limitations may be is not indicated, but in the communities studied they seemed to be corrected more effectively by milk than by tomato, though either or both improved the diets."

Dental decay among Texas school children, J. WHITACRE (*Texas Sta. Bul.* 491 (1934), pp. 30, figs. 8).—Dental records obtained in the dietary study conducted in three counties of the State (E. S. R., 71, p. 562) and in the study of growth in height and weight of school children conducted in San Antonio (E. S. R., 71, p. 878) have been analyzed with relation to race, sex, age, and diet. In all 6,701 records were examined, including 4,453 for white, 807 for Mexican, and 1,441 for negro children. The dental examinations in the first study, comprising 4,926 children, were made by local dentists, using a mirror and explorer, and in the second, comprising 1,775 children, by a pediatrician, using a tongue depressor but no mirror. In both studies all teeth which had unfilled cavities, or fillings, or were abscessed, and the permanent teeth which had been extracted were regarded as carious, each unsound tooth being considered only once.

"The consistently higher average number of carious teeth per child among comparable groups of children examined with mirror and explorer than without them indicates that the former method was the more searching. Nevertheless, the interrelations of races with respect to carious teeth are concordant in the two studies, which are used jointly in making generalizations."

In all three races in the first study the percentage of children having one or more decayed teeth increased with age, while the opposite was true in the second study. "Among all children the percentage with decayed 6-year molars increased rapidly up to 12 or 14 yr. of age, after which there was a decline in four of six age groups. Apparently some factor (or factors) predisposing to decay in the younger children and protective in the older ones was operating in the San Antonio groups that was not operating among the children from Brazos, Hidalgo, and Jefferson Counties. Age appears to be one factor, but not the only one, in determining the number of children in whom decay occurs."

The diet records secured in the first study (E. S. R., 71, p. 562) were compared with the dental records, with the following conclusions:

"As the consumption of milk increased, the percentage having carious 6-year molars decreased in five out of seven groups of white children. On the contrary, as the consumption of cereals increased, there was an increase in the percentage having decayed 6-year molars among six out of seven groups of white children and two out of four groups of negroes; also as the consumption of sweets increased, five out of seven groups of white children and three out of four negro groups showed an increased percentage with decayed 6-year molars. This suggests that milk in the diet is conducive to soundness of teeth and that excessive amounts of cereals and sweet foods in comparison with other foods are detrimental. No difference was found in the diets of the three races to account for the lower prevalence of decayed teeth among the Mexican and negro as compared with that among the white children, nor for the fact that 6-year molars constituted a larger proportion of all decayed teeth among Mexican and negro than among white children."

A final comparison is given of the extent of caries, as observed in the present study, with reports of various recent studies, including those in Virginia (E. S. R., 57, p. 387), Massachusetts (E. S. R., 59, p. 790), Florida (E. S. R., 64, p. 284), Georgia (E. S. R., 60, p. 787), and South Carolina (E. S. R., 64, p. 285). "The findings of this study in general agree with those of contemporaneous studies of similar nature in eastern and southern sections of the United

States, both with respect to the high incidence of caries and to the relationship existing between certain classes of food and the occurrence of caries."

Relation of diet to dental caries, J. TILT (*Med. and Prof. Woman's Jour.*, 41 (1934), No. 2, pp. 48-54).—A review of recent literature.

Use of concentrated diet in childhood tuberculosis and malnutrition, G. E. PRATT (*Arch. Ped.*, 51 (1934), No. 8, pp. 529-533).—A group of 40 undernourished children, 35 of whom had positive intradermal tuberculin tests, were given powdered whole milk in amounts of 1 lb. weekly as a supplement to their home diets, which were considered fairly adequate. The milk, which was used in cooked foods such as creamed soups, creamed vegetables, and mashed potatoes, increased the calorie content of the diet by about 300-350 calories a day and also increased quite substantially the daily intake of fat, protein, and carbohydrate, calcium and phosphorus, and vitamins A and G without appreciably increasing the bulk of the diet.

In the entire group an average gain of 3.7 lb. occurred during the 12-week experimental period, the gains ranging from 1 to 8 lb. The physical condition of the children likewise showed improvement. In the author's opinion powdered whole milk is a valuable adjunct in the dietary treatment of childhood tuberculosis, malnutrition, and undernourishment.

Vitamin standards of International Conference being adopted in U. S., E. M. NELSON (*U. S. Dept. Agr. Yearbook 1934*, pp. 366-368).—This contribution from the Bureau of Chemistry and Soils is a brief discussion of the international vitamin standards, the extent of their adoption in the United States, and the possibility of future changes in the standards.

Swiss regulations as to spurious vitamins (*Jour. Soc. Chem. Indus., Chem. and Indus.*, 53 (1934), No. 3, pp. 53-56).—Instructions regarding the permitted descriptions of the vitamin content of commercial food products prepared by the Federal Service of Public Hygiene, Switzerland, approved by the Federal Department of the Interior, and made effective June 30, 1934, are given, with the statement that they may well serve as a model of the kind of legislation which should be enforced in Great Britain. Included among the instructions are statements concerning the general nature and action of the vitamins and the function of the individual vitamins. Of particular interest are the following instructions:

"Packages and literature must always carry a statement of the vitamins contained in the foodstuff. When the vitamin content as well as the quantity of the vitamin necessary for daily consumption are indicated by figures, these figures must be those of the official analysis. In the case of a foodstuff containing vitamin D, one must mention as a rule the daily consumption of this food which must not be exceeded.

"It is forbidden to reproduce or mention in the advertisements recommendations or certificates, even if they have been provided by experts."

[Vitamin investigations] (*Idaho Sta. Bul. 205* (1934), pp. 48, 49, fig. 1).—This progress report (E. S. R., 69, p. 898) includes a discussion of the value of the Netted Gem potato as a source of vitamin C in different states of maturity and storage, and brief notes on the vitamin A content of pasture plants.

Vitamin therapy in colds, H. C. CAMERON (*W. Va. Univ. Bul.*, 34 ser., No. 15 (1934), p. 25).—This is a preliminary report of an investigation carried on at the West Virginia Experiment Station to test the value of cod-liver oil as a protection against the common cold. Sixty-five women students at the University of West Virginia were divided into five groups, the members of one of which took a tablespoonful of cod-liver oil daily from November to March 1932-33 and the other groups an equivalent dose of a vitamin A concentrate,

a cod-liver oil residue in tablet form, an inert tablet, and no medication. Records were made twice a week during the experimental period on the presence and duration of colds. The number of days with colds reported from the group taking no medication was considerably higher than from any of the other groups. The vitamin A concentrate and the cod-liver oil residue tablets appeared to give slightly better results than the cod-liver oil.

"No conclusion is as yet justified from these results, but the volunteers participating in the experiment were unanimous in reporting subjective improvement from cod-liver oil and its concentrates. This improvement took the form of increased appetite, weight, or endurance, or relief from skin eruptions or from sinus trouble, as well as in reduction in number and duration of colds. These changes can probably be attributed to the improved nutrition resulting from an abundance of vitamin A, and this improved nutrition is worth while in itself whatever final conclusions are reached with reference to vitamin therapy against common colds."

The vitamin B and G content of wheat germ, rice polishings, cottonseed flour, and the residue from fermented rye grains, H. E. MUNSELL and G. M. DEVANEY (*Cereal Chem.*, 10 (1933), No. 4, pp. 287-297, figs. 2).—In this contribution from the Bureau of Home Economics, U. S. D. A., quantitative determinations of the vitamin B and G content of various cereal products and of dried brewers' yeast are reported, with the following average values in Sherman units per gram: For vitamin B, yeast 11, wheat germ 7, wheat 1.5, rice polishings 6, cottonseed flour 5, and residue from fermented rye grain 0.4; and for vitamin G, yeast 17, wheat germ 3, wheat 1, rice polishings 1, and cottonseed flour 2. When these values were compared on the basis of yeast as 100, the wheat germ had a vitamin B value of 60 and a G value of 15. Corresponding values for wheat were 13 and 5, rice polishings 53 and 4.5, and cottonseed flour 43 and 10, respectively.

The influence of the composition of yellow corn on the effectiveness of a rachitogenic ration, A. D. HOLMES and F. TRIPP (*Cereal Chem.*, 10 (1933), No. 4, pp. 313-329, fig. 1).—The results of analyses for total ash and for calcium and phosphorus of 7 samples of rachitogenic rations prepared under uniform methods showed that the ash content varied from 3.77 to 4.95 percent, the calcium from 1.205 to 1.434, and the phosphorus from 0.27 to 0.317 percent of the ration (dry basis), and the Ca:P ratio from 4.062 to 5.198 parts of Ca to 1 of P. Similar data on 4 samples of rachitogenic rations secured from other laboratories showed as wide divergences, not only among themselves but in comparison with the first series analyzed.

As yellow corn formed the greater part of the rations, 11 samples of ground whole yellow corn obtained from various localities were examined. These showed wide variations in fineness, suggesting one source of the variations in composition of the different rations. This was also shown by analyses of portions of the entire rations passing through sieves of different mesh for gluten, calcium carbonate, and sodium chloride. The calcium carbonate passed through all of the sieves, but only 51.6 percent of the gluten and 0.1 percent of the sodium chloride passed through the finest sieve.

The ash content of the different samples of corn ranged from 1.35 to 2.12 percent, calcium from 0.018 to 0.221, and phosphorus from 0.249 to 0.342 percent (dry basis), and the Ca:P ratio from 0.06 to 0.75 part of calcium to 1 of phosphorus.

Other data are reported from the literature showing wide variations in the content of calcium, phosphorus, and vitamin A in different samples of yellow corn, and some of the factors responsible for these differences are discussed,

with the conclusion that "since the rachitogenic ration in question contains 76 percent of yellow corn, it is quite apparent that, in order to obtain a uniform degree of rickets in successive groups of experimental animals, attention should be given to the composition of the yellow corn used in the preparation of the rachitogenic ration."

An extensive list of literature references is appended.

TEXTILES AND CLOTHING

Wool yield and fleece density can be measured by a simplified method, J. I. HARDY (*U. S. Dept. Agr. Yearbook 1934, pp. 378-380, fig. 1*).—A sample, 1 or 2 in. wide and 4 to 5 in. long, is clipped close to the skin from the side of each sheep, is weighed at once or put in a moisture-tight container and weighed later, and the cleared area is measured. About 25 samples, each in a tagged open-mesh bag, are placed in a larger open-mesh bag and are drycleaned by the same procedure used for men's suits, and when cleaned and thoroughly dry are reweighed for determining yield and density.

Technological reports on standard Indian cottons, 1933, N. AHMAD (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. A, No. 24 (1933), pp. 94, figs. 18*).—Results of studies of the fiber properties and yarn characteristics on the standard Indian cottons of the 1932-33 season and summarized data on the seasons 1923-33 are reported on as heretofore (*E. S. R.*, 68, p. 134).

Home dyeing with natural dyes, M. S. FURRY and B. M. VIEMONT (*U. S. Dept. Agr., Bur. Home Econ., 1934, pp. 26*).—This mimeographed publication, which has been prepared particularly for handicraft industries, includes a description of the different kinds of natural dyestuffs with their action on various textile fibers, methods of testing the fastness of dyes to light and washing, and equipment and supplies for dyeing. The rest of the publication is devoted to tested dye recipes and a table of colors, showing the dye materials for producing desired colors on wool and cotton fabrics.

HOME MANAGEMENT AND EQUIPMENT

A study of factors of economy in electrical cooking of a typical day's meals in Maine, L. SMITH (*Maine Sta. Bul. 371 (1934), pp. 33-87, figs. 3*).—This is the complete report of an investigation which has been noted previously from progress reports (*E. S. R.*, 71, p. 575).

It is noted that the extension of the use of electricity for cooking on Maine farms has not been as rapid as its adoption for lighting and power. Of various factors suggested as responsible for this, the high cost of operation of electric ranges due to inefficient methods of use was selected for particular study. From meal records kept by a number of cooperating housewives a menu was selected which was fairly representative and contained foods the preparation of which would give definite management problems. For each of these foods one or two variables in cooking methods were studied to determine possibilities of economy of fuel. The menu was as follows: Breakfast—fruit, rolled oats, poached eggs, toast, butter, and coffee; dinner—roast pork, green beans, potatoes, bread, butter, and apple pie; and supper—beef hash, hot biscuits, butter, fruit sauce, home-made cookies, and tea. The variables studied comprised three groups. "In the first the comparison is between the general-purpose range unit and the small, specialized piece of equipment, such as the toaster or the percolator. In the second the materials, sizes, and condition of utensils constitute the significant variables. In the third, which is composed of manage-

ment problems, the selection of the size of unit, the relation of the size of the utensil to that of the unit, the choice of surface units or the oven, the use of the 'preheating' and 'cooling' periods, etc., are studied."

The electric range and other apparatus used in the study are described, and the various tests made are given in the form of the following case reports: Case 1, an electric toaster v. a range oven to toast bread, (2) electric v. non-electric percolators for making coffee, (3) American Russia iron v. aluminum baking sheets for baking biscuits, (4) the baking sheet v. a pan for baking cookies, (5) a shallow v. a tall pan of the same bottom diameter for heating water, (6) a flat v. a buckled frying pan for poaching eggs, (7) no rim v. a rim on the bottom of a frying pan, (8) a large v. a small unit with kettles of suitable size, (9) a small v. a large unit to heat water in a large frying pan, as in poaching eggs, (10) a kettle too large in diameter v. one too small in diameter for use on a unit of large diameter, (11) low v. high wattage to maintain boiling, as in the cooking of potatoes, (12) a minimum v. an excessive quantity of water used to boil potatoes, (13) 45 min. v. 1½ hr. to cook green beans, (14) a covered v. an uncovered pan for heating water, as in cooking cereal, (15) surface v. oven cooking v. a combination of both to cook meat and two vegetables, (16) a preheated v. a nonpreheated oven to bake hash and biscuits, (17) continuous v. intermittent oven cooking, (18) a preheated v. a nonpreheated unit to heat dishwater, and (19) boiling maintained with stored heat in the unit. For each of the comparisons tabulated, data are given showing the time involved, the voltage and electric energy required, and the additional time and energy required for the less efficient (in each case the second) of the methods compared.

In a final table the day's menu is given, with the electrical energy required to cook the meals and to heat the necessary dishwater, using the more and less efficient methods selected for study. The total electrical energy for the combination of the more efficient methods was 6.937 kw.-hr. per day and for the less efficient 10.228 kw.-hr. per day, although the methods selected did not represent extremes in management and choice of utensils.

Kitchen equipment and arrangement: A study of the time spent and the steps taken in kitchen work in relation to the kind and arrangement of equipment, M. MUSE (*Vermont Sta. Bul.* 375 (1934), pp. 59, figs. 44).—The studies reported were conducted in two farm-home kitchens and in a laboratory kitchen, using in both cases process charts, the stop watch, and the pedometer as research tools. The process charts used in the farm kitchen consisted merely of records of the sequence of the processes or tasks observed. In the laboratory the charts were made to serve four purposes: (1) As records of operations and transportations, (2) as records of time spent and steps taken, (3) as instruction sheets, and (4) as a means of visualizing advisable changes.

In the farm kitchen studies the research worker first observed each woman perform several short tasks, taking notes on the sequences of the process, the manner in which the work was done, the amount of time spent, and the number of steps taken. The homemakers themselves kept records during a typical week of the tasks performed, amount of time consumed, and number of steps taken in meal preparation, serving, and cleaning up. A careful study was made of each kitchen and its equipment. With all of these records as a basis, rearrangements of the kitchens were made, after which the homemakers again performed the same tasks to determine the saving of time and steps effected. The arrangements of the two kitchens before and after the changes are described and illustrated with photographs, and the data obtained are presented in tabular form. A process chart is also given for making a simple cake in one of the kitchens before and after the rearrangement.

The most striking effect of the new arrangements in both cases was in shortening the number of steps taken. In the first kitchen the total number of steps taken in preparing, serving, and cleaning up after three meals a day for 1 week were 2,297 in the old and 1,445 in the rearranged kitchen. In the second kitchen, which was entirely remodeled, the number of steps was reduced from 3,215 to 1,034. In the cake-making test carried out in the first of the two kitchens, the number of steps were reduced from 105 to 21, the time from 12 min. 4 sec. to 5 min. 17 sec. and the distance walked from 144 ft. to 39 ft. as the result of the comparatively simple rearrangements made.

The laboratory study was confined to the preparation, serving to 5 people, and clearing away of a simple dinner which was not altered during the entire study. An arrangement was first made somewhat representative of the ordinary farm kitchen, and after the necessary data were secured one item after another was changed, or a single piece of equipment added until a total of 10 different arrangements had been made, for each of which data were secured on the amount of time spent and steps taken for the entire process.

The entire time spent in the first arrangement was 3 hr. 46 min. 17 sec. and in the final 2 hr. 5 min. 35 sec. The total number of steps taken was reduced from 1,516 to 131. Floor plans and photographs illustrate the various arrangements of the laboratory kitchen.

In discussing the purpose of the various changes made and the use that can be made by the homemaker of the results of this study, the author emphasizes the fact that "neither these pieces of equipment nor any of these arrangements of equipment are proposed for exact duplication in any home. The results of this study are published with the hope that they will inspire improvements of home kitchens, each of which presents individual problems."

It is pointed out that process charts, such as were used in this study, may be made by a person possessing no technical training who is willing to observe the work of another and make notes concerning methods of work and sequence of a process. "The important thing is to make the worker, or another person who is planning the improvements, conscious of the exact manner in which the work is accomplished. A written record of the present method is the best way of accomplishing this, and such a record has the additional advantage of almost invariably suggesting improvements which could be made."

MISCELLANEOUS

Yearbook of Agriculture, 1934, H. A. WALLACE ET AL. (U. S. Dept. Agr. Yearbook 1934, pp. IV+783, figs. 119).—This contains a discussion of The Year in Agriculture (pp. 1-99) as the Secretary's report to the President, over 100 brief articles under the general title of What's New in Agriculture and noted in part elsewhere in this issue, and agricultural statistics noted on page 126.

Federal legislation, rulings, and regulations affecting the State agricultural experiment stations (U. S. Dept. Agr., Misc. Pub. 202 (1934), pp. 36).—This is a revision, primarily from the viewpoint of the experiment stations, of the publication previously noted (E. S. R., 49, p. 195).

Science aids Idaho farmers: Annual Report of the [Idaho] Experiment Station for the year ending December 31, 1933, E. J. IDDINGS (Idaho Sta. Bul. 205 (1934), pp. 79, figs. 28).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Report of Moses Fell Annex Farm, Bedford, Indiana, June 1934, H. J. REED and H. G. HALL (Indiana Sta. Circ. 203 (1934), pp. 20, figs. 9).—The experimental work summarized is for the most part abstracted elsewhere in this issue.

Forty-sixth Annual Report of [Kentucky Station], 1933, I, T. P. COOPER (*Kentucky Sta. Rpt. 1933, pt. 1, pp. 69*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Fifty-third and Fifty-fourth Annual Reports (First Biennial Report) of the New Jersey State Agricultural Experiment Station and the Forty-fifth and Forty-sixth Annual Reports (First Biennial Report) of the New Jersey Agricultural College Experiment Station for the 2-year period ending June 30, 1933, J. G. LIPMAN ET AL. (*New Jersey Stas. Bien. Rpt. 1932-33, pp. XXXV+163*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Forty-seventh Annual Report [of Vermont Station, 1934], J. L. HILLS (*Vermont Sta. Bul. 380 (1934), pp. 24, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Publications available for free distribution (Idaho Sta. Circ. 73 (1934), pp. 4).—A list of the publications available as of June 1934.

Agricultural index, 1858-1931 (Nanking, China: Univ. Nanking, 1933, pp. XXIV+731+VII+153).—This subject index, mainly in Chinese, includes an English section of about 160 pages, covering the period from 1858 to 1931 and including 36 English publications and 19 Chinese publications occasionally containing articles written in other languages. Over 6,000 entries are included.

Bibliography of tropical agriculture, 1933 (Roma: Internatl. Inst. Agr., 1934, pp. VIII+140).—This is a classified bibliography for the year 1933, with annotations in English and French.

Crop and soil management practices (Maryland Sta. Bul. 362 (1934), pp. 365-399).—The short, nontechnical reports here presented are noted elsewhere in this issue.

Turkish agriculture (Asiatic section—Anatolia), P. M. ZHUKOVSKIĬ (P. JOUKOVSKY) (Zemledeľcheskaia Turtsiia (Aziatskaia Chast—Anatoliia). Moskva (Moscow): Vsesoiūzn. Akad. Selsk. Khoz. Nauk Lenina, Inst. Rasteniievod. [Lenin Acad. Agr. Sci., Inst. Plant Cult.], 1933, pp. XXVII+908, pls. 12, figs. [385], map 1).—This comprehensive manual, edited by N. I. Vavilov, is mainly in Russian, but contains a table of contents and an extensive résumé (pp. 773-908) in French. The copious illustrations also bear French titles.

NOTES

Alaska Station.—Weed control in the grain fields is becoming a major problem. A rotary hoe has been added to the station equipment and will be used next season in the rotation fields. Other equipment added includes a ½-ton truck, a 7-ft. mower attachment for the tractor, and a potato planter with fertilizer attachment.

Don L. Irwin has been appointed superintendent of the Matanuska Substation and began his duties July 1.

Arizona University and Station.—Dr. W. J. Pistor, assistant professor of veterinary medicine in the Washington College, has been appointed associate professor of veterinary medicine and associate veterinarian in the College of Agriculture and the station.

Kansas College and Station.—G. T. Klein, assistant professor of poultry husbandry, has resigned to become extension poultry husbandman in the Massachusetts College. Fred P. Eshbaugh has been appointed forest nurseryman at the Fort Hays Substation succeeding E. W. Johnson, resigned to accept a position with the U. S. D. A. Division of Dry Land Agriculture with headquarters at Woodward, Okla.

Library of the International Institute of Agriculture.—Quarters erected for the specific purpose of library use have recently been occupied. A three-story and basement structure, with steel stacks and shelving, elevator service, and a specially designed central reading room, has been provided. The library now contains 270,000 books and pamphlets and receives currently over 3,300 periodicals.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 4, the following section officers were elected at the Washington meeting, November 19–21, 1934: Agriculture, J. G. Lipman of New Jersey, chairman, O. B. Martin of Texas, vice chairman, and H. W. Mumford of Illinois, secretary; engineering, Paul Cloke of Maine, chairman, and H. B. Dirks of Michigan, secretary; and home economics, Wylle B. McNeal of Minnesota, chairman, and Alba Bales of North Dakota, secretary. In the section of agriculture, the subsection of experiment station work elected Andrew Boss of Minnesota, chairman, and A. B. Conner of Texas, secretary; the subsection of extension work, K. L. Hatch of Wisconsin, chairman, and J. C. Taylor of Montana, secretary; and the subsection of resident teaching, I. L. Baldwin of Wisconsin, chairman, and L. J. Horlacher of Kentucky, secretary.

Many changes were announced in the committees and personnel. A special committee on land problems was established, consisting of F. D. Farrell of Kansas, chairman, T. O. Walton of Texas, C. E. Ladd of New York, William Peterson of Utah, H. W. Mumford of Illinois, and J. A. Burruss of Virginia.

The committee on instruction in agriculture, home economics, and mechanic arts was replaced by three committees as follows: Instruction in agriculture, 3 yr., W. C. Coffey of Minnesota and H. P. Baker of Massachusetts, 2 yr., Dan T. Gray of Arkansas and E. J. Iddings of Idaho, and 1 yr., P. W. Chapman of Georgia and E. H. Shinn of Washington, D. C.; instruction in engineering, 3 yr., A. G. Crane of Wyoming and R. L. Sackett of Pennsylvania, 2 yr., M. L.

Enger of Illinois and O. J. Ferguson of Nebraska, and 1 yr., C. Derleth, Jr., of California and S. B. Earle of South Carolina; and instruction in home economics, 3 yr., Margaret S. Fedde of Nebraska and Genevieve Fisher of Iowa, 2 yr., M. Marie Mount of Maryland and Jessie W. Harris of Tennessee, and 1 yr., Edith P. Chace of Pennsylvania and Mildred P. French of Connecticut.

In the committee on experiment station organization and policy H. W. Mumford of Illinois and F. D. Fromme of West Virginia succeeded L. E. Call of Kansas and F. J. Sievers of Massachusetts for 3-yr. terms, and there were added as a subcommittee on home economics Marie Dye of Michigan, 3 yr., Sybil L. Smith of the Office of Experiment Stations, 2 yr., and Margaret Justin of Kansas, 1 yr. A similar subcommittee on home economics was added to the committee on extension organization and policy, consisting of Annette T. Herr of Massachusetts, 3 yr., Kathryn V. Burns of Illinois, 2 yr., and Mildred F. Horton of Texas, 1 yr., while on the same committee C. W. Creel of Nevada and I. O. Schaub of North Carolina replaced P. H. Ross of Arizona and C. A. Keffer of Tennessee for 3-yr. terms. R. S. Shaw of Michigan and W. E. Clark of Nevada succeeded M. G. Neale of Idaho and H. S. Boardman of Maine for 3-yr. terms on the committee on college organization and policy.

Other new appointments for 3-yr. terms included H. L. Kent of New Mexico and R. G. Bressler of Rhode Island to the committee on military organization and policy vice J. R. Turner of West Virginia and Alfred Atkinson of Montana; E. B. Norris of Virginia to the committee on engineering experiment stations vice Paul Cloke of Maine; R. M. Hughes of Iowa, vice R. C. Higgy of Ohio, and H. J. C. Umberger of Kansas (reappointment) to the committee on radio; O. M. Leland of Minnesota, vice E. B. Norris of Virginia, and W. L. Bevan of Iowa (reappointment) to the committee on aeronautics; and J. D. Hoskins of Tennessee vice E. C. Brooks of North Carolina to the committee on land-grant institutions for negroes. F. L. McVey of Kentucky replaced R. M. Hughes of Iowa as a delegate for 3 yr. to the American Council of Education.

The joint committee of the association and the U. S. Department of Agriculture on projects and correlation of research was reconstituted by the substitution of V. R. Gardner of Michigan for H. W. Barre of South Carolina and F. D. Richey for Knowles Ryerson of the Department. On the committee on publication of research the only change was the replacement of C. G. Williams of Ohio by C. E. Ladd of New York.

Third International Congress of Soil Science.—This Congress will be held in Oxford, England, from July 30 to August 6, 1935, followed by a 3-week tour of England, Wales, and Scotland. The program includes among other features a number of sessions under the auspices of the Subcommission for Peat Soils, with the main topic the comparative study of low moor peat land from the standpoint of morphological profile features and the influence of drainage on the physical, chemical, and biological properties of peat soils.

Further information may be secured from Drs. A. G. McCall and R. V. Allison, both of the U. S. D. A. Bureau of Chemistry and Soils. Dr. McCall is serving as representative of the U. S. National Section and Dr. Allison as chairman of the regional committee.

Oberly Memorial Prize.—The current biennial award of this prize (E. S. R., 50, p. 900), given for the best bibliography in the field of agriculture or the natural sciences, has been postponed until March 1, 1935. Any who wish to enter the contest should submit, before February 1, four copies of their bibliography to the chairman of the Oberly Memorial Fund committee of the American Library Association, Gilbert H. Doane, librarian of the University of Nebraska.

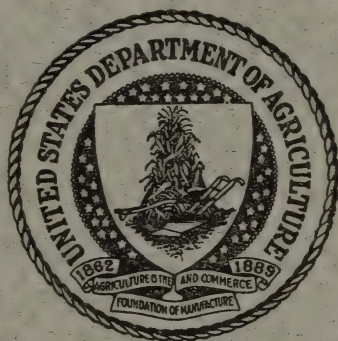
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 72

FEBRUARY 1935

No. 2

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
Agricultural Meteorology—W. H. BEAL.
Soils and Fertilizers—H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—H. P. BARSS.
Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
Agricultural Engineering—R. W. TRULLINGER.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition—SYBIL L. SMITH.
Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
Home Management and Equipment—
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOL. 72, NO. 2

Editorial:	Page
Research at the 1934 convention of the Association of Land-Grant Colleges and Universities.....	145
Recent work in agricultural science.....	150
Agricultural and biological chemistry.....	150
Agricultural meteorology.....	158
Soils—fertilizers.....	160
Agricultural botany.....	165
Genetics.....	168
Field crops.....	174
Horticulture.....	182
Forestry.....	193
Diseases of plants.....	195
Economic zoology—entomology.....	213
Animal production.....	233
Dairy farming—dairying.....	241
Veterinary medicine.....	249
Agricultural engineering.....	261
Agricultural economics.....	266
Rural sociology.....	272
Agricultural and home economics education.....	275
Foods—human nutrition.....	275
Textiles and clothing.....	284
Home management and equipment.....	285
Miscellaneous.....	286
Notes.....	287

EXPERIMENT STATION RECORD

VOL. 72

FEBRUARY 1935

No. 2

EDITORIAL

RESEARCH AT THE 1934 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

In a gathering at which "organized planning" and "coordination and cooperation of effort" were almost bywords, it would be expected that much would be said as to the application of these terms to research. Such a condition obtained at the 1934 convention of the Association of Land-Grant Colleges and Universities, and in addition other aspects of the current research situation received due consideration. Seldom has there been more tangible evidence of the realization that the continued development of agricultural research is a vital factor in any organized planning of the national life; that in this research well-defined objectives, efficiency, and coordination and cooperation are both timely and essential; and that if agricultural research is to maintain and increase its effectiveness, there must be adequate provision for its financial support and its specific needs.

The experiment station section, in which of course agricultural research matters are of primary concern, held two crowded sessions. At the first, research was considered in its relation to planned agriculture. The second was primarily an open conference, participated in both by station directors and bureau chiefs and others from the U. S. Department of Agriculture, on a coordinated program of research. In addition the joint sessions of the three subsections on agriculture included a paper by Director W. L. Slate of Connecticut on The Relationship of the Experiment Station to State and Regional Planning, and a number of others, notably those of Director C. E. Ladd of Cornell on The Use of Federal Appropriations by the States, of Director R. L. Watts of Pennsylvania entitled New Emphasis on Old Elements in the Agricultural Program, and of Extension Director H. J. C. Umberger of Kansas on The Relationship of the Land-Grant Colleges to the AAA Programs, which had much to do with research. Many of the addresses before the general sessions and elsewhere also had more than incidental references in the same field.

In the discussion of research in relation to planned agriculture, one definite impression to be obtained was that of the need, in any

scheme of long-time planning, of basic information such as research agencies should supply. In other words, there was general recognition of the fact recently pointed out by Dr. Scott Watson in his presidential address to the section on agriculture of the British Association that "economic planning must not be regarded as a substitute for scientific education and research." This was clearly set forth in the papers relating to land use given by Hon. M. L. Wilson, Assistant Secretary of Agriculture, and Dr. H. R. Tolley, Director of the Program Planning Committee of the Agricultural Adjustment Administration, both of which gave a clear exposition of the complexity and difficulties confronting devisers and administrators of such programs and expressed appreciation of the contributions by the stations in this direction, including what had been accomplished along production lines.

Applicable in this discussion was also a portion of the presidential address of President T. O. Walton of Texas, who saw no incompatibility between agricultural research and curtailment of production, since such research brings uncontrolled natural factors under control and thereby simplifies the problems of their evaluation. A similar thought was also voiced by Director Watts in the following language: "A permanent and prosperous agriculture can never be based on ignorance and inefficiency. Efficient production means economic production, and economic production is most likely to yield satisfactory profits. No thoughtful agricultural leader today is arguing for inferior farm animals, lean acres, uncontrolled plant and animal diseases and insect pests, forage crops which fail to adequately nourish our farm animals, or the substitution of the old irksome methods of performing farm work for our modern labor-saving machinery and devices."

Other general aspects of the recent impetus toward organized planning was revealed in the discussion of land utilization by Mr. F. A. Delano, chairman of the National Resources Board, and Dr. L. C. Gray, in charge of the Division of Land Economics, U. S. D. A. Bureau of Agricultural Economics; of rural rehabilitation, by Mr. Harry L. Hopkins, administrator of the Federal Emergency Relief Administration, and Dr. Dwight Sanderson, coordinator of rural research in that organization; and by Mr. Walton Hale Hamilton, a member of the National Industrial Recovery Board, as to the meaning of NRA. The relation of the experiment stations to such planning was discussed with specific reference to State planning boards by Director Slate, who concluded, in part, that "if the purpose is to assemble all the available facts and gather more that are needed, if the making of comprehensive plans is deferred until they will bear the scrutiny and criticism of intelligent citizens and legislators, then it would seem that the station can well afford to take an

active or even a guiding part in State planning. Direct representation on the planning board would seem to be the logical method of bringing the station into its fullest usefulness."

The conference between Department and station administrative officers was deemed so advantageous that provision was made for its continuance as a permanent feature of the program in those alternate years in which the convention is held in Washington. This was on final recommendation of the special committee on Federal-State relationships, which has rendered valuable service in bringing closer together representatives of the two great systems of agricultural research.

Reason for much optimism in this connection was seen in the introductory statement to the conference by Mr. J. T. Jardine, Chief of the Office of Experiment Stations. "There has been", he stated, "more effective coordination and cooperation in the past year than in any other similar period in the history of the Department and the State stations." He added that "there is more need and opportunity for coordination and cooperation at present than ever before. National and State recovery programs have given rise to both exceptional demands and exceptional opportunities for effective use of accumulated findings from research and for the knowledge and experience of the research workers. Over 600 State station staff members have been called upon during the past year to undertake special assignments covering the broad field of agriculture and rural life, and including planning, administration, and direction, as well as research. The current research program, the accumulated findings from research, and experienced personnel have been brought into cooperation with recovery agencies."

During the year, he pointed out, a total of 685 cooperative researches involving 760 separate agreements were undertaken by the Department in cooperation with the stations. Specific instances of the speed and effectiveness of such cooperation in dealing with projects of national and regional scope were cited, as well as a marked advance in working relationships.

Some of these same matters were also discussed in greater detail in the report of the joint committee on projects and correlation, presented by Director F. B. Mumford of Missouri. Director Mumford brought out that all but one of the stations cooperated with the Department during the year, the number of agreements per station ranging from 1 to 44. About 31 percent of the agreements involve from 5 to 23 State stations and "represented features of highly coordinated cooperative agricultural research undertakings, whereas only 29 percent of the agreements fell into this category during the previous year. However, the fact that about two-thirds of the cooperative agreements active during the year represented more

isolated individual cooperation between single bureaus of the Department and only 1 or 2 stations suggests that all the possibilities for more highly coordinated and more efficient cooperative research in agriculture have not been exhausted."

The approximately 600 special assignments of staff members, referred to by Mr. Jardine, were shown to have included such duties as the presidency of Federal land banks, the chairmanship of State planning boards, regional, State, or local leadership of national recovery activities, and participation in various ways in many research studies of emergency character. It involved studies in cooperative relationships with the Federal Civil Works Administration on farm tax delinquencies, farm mortgage foreclosures, and farm land values; of subsistence homesteads and part-time farming in cooperation with the Department of the Interior; of land uses and land-use policies and control of agricultural production in cooperation with the AAA and other agencies; of land bank and credit policies with Farm Credit Administration; of farm housing, rural electrification, and soil erosion with the agencies therewith concerned; and other studies of less extensive scope.

As a whole, therefore, the committee concluded that "the record of cooperative agricultural research for the year would appear to go a long way toward vindicating a system which stimulates coordination of the efforts and facilities of research agencies interested in common problems and the most efficient use possible of the research facilities, finances, and personnel of individual research institutions." The continuation of the encouragement and support by the station section and the executive body of this increasing cooperation in research as directed toward the solution of problems of regional and national significance was recommended, and the specific request was made for the appointment by the association of the special committee on land problems authorized at the 1933 convention. Subsequently this committee was duly appointed, as already noted, under the chairmanship of President F. D. Farrell of Kansas.

Attention was also called by the committee to the very difficult financial situation of the research institutions themselves as a result of the depression. "Concurrent with often drastic curtailments of State and local funds and considerable uncertainty regarding Federal funds during the year have come more and more insistent demands for adequate information with which to guide local, State, regional, and national programs of readjustment and recovery." The committee found, however, that despite these difficulties the agencies of research have continued to function with all of their normal courage and vigor possible under the circumstances. Means of alleviating the situation were discussed by the section, and the problem advanced for consideration by the executive body.

The perennial question of the publication of the results of station research received attention at various points in the program. A report by Miss Sybil L. Smith of the Office of Experiment Stations from the committee on research of the division of home economics as to sources and means of publication of research in that subject revealed a reasonably adequate provision, the chief difficulties arising with masters' theses. A total of 167 publications on home economics was listed for the year, of which over half were journal articles and 61 experiment station publications and in the *Journal of Agricultural Research*. The important role of scientific journals as disseminators of agricultural research was also attested by the committee on experiment station organization and policy, which recommended study of the possibilities of furthering such publication by the assumption of a part of the cost by the stations in return for separates or in other ways.

The distribution of station publications abroad was another phase to receive attention, and the special committee on this subject was requested to study the matter further. During the year considerable progress was made in the collection of information through the revision by the Office of Experiment Stations of its list of Agricultural Research Institutions and Library Centers in Foreign Countries, the unique and useful publications of the International Institute of Agriculture at Roma, such as *Les Institutions d'Expérimentation Agricole dans les Pays Tempérés* and *Les Institutions de Laiterie dans le Monde*, and the revision of International Directory of Agricultural Experimental Institutions in Hot Countries and International Directory of Agricultural Engineering Institutions, and the studies of the Minnesota Experiment Station and others. While the diversity of interests of the approximately 50 State experiment stations is such that it seems hardly likely that any single mailing list can be formulated to meet all needs, it is believed that sources of information are now available for the handling of this matter by individual stations much more effectively than ever before.

The congestion in the experiment station section was such that a recommendation was formulated for an additional session at the next convention, presumably in the nature of a more or less informal conference preceding the regular program. If this plan is carried out, it is likely that the 1935 meeting, probably to be held in Chicago about mid-November, will be even more informative than in recent years, and that opportunities will be available for still further advancement of the policies of full utilization of available resources and constructive cooperation and coordination of work in which there is now such general interest and which seem to hold out such substantial possibilities.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical work of the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed., pp. 68-75*).—Data are reported on the production of a form of cellulose extracted from bagasse and cane straw, on the storage and preservation of tropical fruits, on the utilization of the native flours in an industrial form, the preparation of the essential oils of fruits and tropical plants, and on the production of a honey of a quality uniform with respect to density, color, and clarity.

The forms of nitrogen in infusions of corn, timothy, red clover, tobacco, and red top, W. S. EISENMINGER (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 4, pp. 375-378).—Having observed that tobacco fields affected with brown root rot had had corn planted on them in the preceding years, while the nonaffected fields had had tobacco planted on them, and that the soil from the fields affected with "brown rot" contained the greater amount of carbon and of reducing substances, the author of this contribution from the Massachusetts Experiment Station carried out the investigation here reported upon "to determine whether there is any analogy between nitrogen derivatives in infusions of specific plants and the results obtained in the field."

Of the methods employed and the results secured it is noted, in part, that "clover infusions were made of corn stover (green and dried), timothy, red clover, tobacco, and redtop. The duration of the infusion period was 7 weeks.

"All the plant infusions at the time of analysis contained ammonia, protein, and proteose nitrogen. Corn and timothy showed low percentages of their total nitrogen in the form of alpha amino and amide nitrogen; tobacco and redtop had high percentages of total nitrogen in the form of ammonia and only traces of alpha amino acids and amides; red clover was intermediate between the two groups in the distribution of its nitrogen compounds."

The water-soluble proteins of the tubercle bacillus, G. A. C. GOUGH (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1049-1054).—An ice-cold suspension of the living bacilli, grown on synthetic medium, was treated with a large excess of absolute alcohol at -10° C. This was replaced by a series of mixtures of alcohol and ether containing successively increasing proportions of ether until a suspension of the organisms in anhydrous ether was obtained, the whole of this treatment being carried out at -3° . The suspension was then filtered into Soxhlet thimbles and exhaustively extracted with ether. The bacilli were dried under reduced pressure, ground in a ball mill, and extracted with water, with 1 l of 5 percent sodium chloride solution, and 1 l of 0.5 percent sodium hydrogen carbonate solution.

"Fractionation of the mixed proteins with half- and fully-saturated ammonium sulfate solutions yields two proteins, possessing many of the properties of albumins and globulins, which show different chemical and immunological characteristics." Warning of the severe reactions induced by the inhalation even of very minute quantities of the dust of the dried ground bacilli is given, and precautions taken to avoid this danger are noted.

The oxidation of sulphhydryl compounds by hydrogen peroxide.—II, Catalysis of oxidation of cysteine by thiocarbamides and thiolglyoxalines, N. W. PIRIE (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1181–1188, figs. 3).—In an extension of earlier experiments,¹ the author has now shown that thiocarbamide catalyzes the oxidation of cysteine to cystine by hydrogen peroxide in acid solution; that dithioformamidine can oxidize cysteine to a sulfenic acid, this being reduced to cystine by cysteine, and that dithioformamidine has no effect on cystine; that substituted thiocarbamides and related substances, such as ergothioneine, are catalytically active (a theory for the mechanism of the action being offered); and that glutathione behaves throughout in a manner similar to cysteine.

Note on the electrometric titration of dl-2-thiolhistidine, G. M. RICHARDSON (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1036–1039, fig. 1).—The author presents the results of measurements by which “dissociation constants of dl-2-thiolhistidine have been reasonably well substantiated at p_K , 1.84, p_{K_2} , 8.47, p_{K_3} , 11.4, corresponding respectively to the $-\text{COOH}$, $-\text{NH}_2$, and $-\text{SH}$ groups of the amino acid. No evidence of the basic dissociation of a cyclic nitrogen atom has been found.” As was to be expected, the pure amino acid did not form a readily reversible oxidation-reduction system.

The biochemistry of silicic acid, I–IV (*Biochem. Jour.*, 27 (1933), No. 4, pp. 990–1021, figs. 3).—The first of these four papers reports a method for determining silicic acid analogous to the reaction utilized by Fiske and Subbarow (*E. S. R.*, 55, p. 310) for the determination of phosphorus, and in the three remaining papers the application of the micro method for the determination of the analytical data required for the biological studies indicated.

I. Micro-determination of silica, E. J. King and H. Stantial (pp. 990–1001).—After considering several procedures for determining silica in biological material, the authors selected a colorimetric method which makes use of the blue color produced when silicomolybdic acid is reduced by 1:2:4-aminonaphtholsulfonic acid, adapting this procedure to the determination of very small quantities of silica.

The potentially color-producing phosphate was removed by precipitation with calcium chloride and ammonia and the silicate recovered in the filtrate. Iron was removed as ferric phosphate in the presence of calcium carbonate “on the acid side of neutrality.” Blood was deproteinized by means of basic ferric acetate, the silica remaining in solution. The procedure has been adapted to urine, blood, and a variety of tissues. Figures demonstrating the degree of accuracy which may be expected are presented.

II. The presence of silica in tissues, E. J. King, H. Stantial, and M. Dolan (pp. 1002–1006).—With the aid of the method detailed in the foregoing paper, it was shown that “silica occurs in small but significant amounts in fetal tissue. A considerable excretion of silicate occurs through the kidneys. The silicate level of the urine of Herbivora is much higher than that of Carnivora. The amount of silica appearing in the urine is markedly influenced by diet. Circulating blood contains only very small amounts of silica. A variety of adult tissues shows marked differences in silica content, lung having the largest amount.”

III. The excretion of administered silica, E. J. King, H. Stantial, and M. Dolan (pp. 1007–1014).—“Introduction of soluble or of particulate silica into the stomachs of animals leads to marked increases in the output of silicate in the urine without any corresponding increase in the blood.

¹ *Biochem. Jour.*, 25 (1931), No. 5, pp. 1565–1579, figs. 14.

"Moderate increases in the concentration of silica in the blood and enormous increases in the urine were observed following the intravenous injection of silicic acid. Not all the silica injected could be accounted for by that recovered in the urine. Intravenous injection of a suspension of finely particulate silica caused death of the animal within a few hours with moderate increases in the urinary silica. The blood appears capable of maintaining a much higher concentration of organic than of inorganic silicate. Injection of a solution of the glycol ester of silicic acid resulted in considerable increases in the 'total' silica content of the blood and moderate increases in the urine. The animals died several days subsequent to the administration of the organic silicate.

"Spraying of silicic acid into the lungs led to increased urinary output, but it is not certain that this was due to absorption from the lungs."

IV. *Relation of silica to the growth of phytoplankton*, E. J. King and V. Davidson (pp. 1015-1021).—"Addition of silicate to a culture solution already containing an abundance of nutrient salts caused increased diatom growth. In high concentration silicic acid appeared to have an unfavorable effect on the growth of diatoms. Dissolution of silica appeared to be more rapid in an autolyzing suspension of diatoms containing chloroform than in one which had been boiled."

The preparation of galacturonic acid from plant materials, with a note on some of its derivatives, H. R. NANJI (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1163-1165).—"The possibilities of sugar beet residues, of apple pomace, and of lemon peel as material to be hydrolyzed directly for the preparation of galacturonic acid were compared, with the result that the last named proved by far the most satisfactory. Galacturonic acid from apple pomace could not be separated from an unknown levorotatory substance.

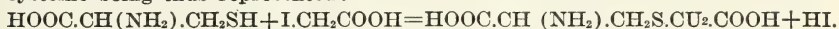
The lemon peel was cut into small pieces and boiled with 60 percent alcohol for a short time, dried, and coarsely powdered. Portions of 100 g were hydrolyzed with 2,000 cc of 3 percent H_2SO_4 for 20 hr., preliminary experiments having shown that a maximum yield of galacturonate was obtained under these conditions. After hydrolysis, the greater part of the sulfuric acid was removed by barium hydroxide, added with vigorous stirring, the remainder by shaking with barium carbonate. The filtrate was evaporated to 400 cc at a temperature below 40° C. This solution was twice decolorized by shaking with norite, and the barium galacturonate was precipitated by pouring it into 3 times its volume of alcohol. The precipitate was well washed with warm alcohol and dried under reduced pressure. The amount obtained from 100 g of the dry peel was 30 g, with an ash content equivalent to 26.48 percent Ba. The barium salt was decomposed with sulfuric acid. It was found that if the sirup did not crystallize within 2 days in a vacuum desiccator it was best to granulate it by means of dry acetone; a considerable amount of brown coloring matter remained in the acetone. Ten g of barium salt gave a yield of 3 g of free galacturonic acid as a white crystalline powder. This could then be recrystallized from a mixture of dilute alcohol and acetone or glacial acetic acid and ether; in either case the acid was dissolved in the minimum quantity of the solvent in which it was soluble and then acetone or ether added until the solution was just turbid and allowed to crystallize. The acid was obtained as white crystals, m. p. 159°.

The absorption spectra of the mixed fatty acids from cod-liver oil, W. J. DANN and T. MOORE (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1166-1169, fig. 1).—"The mixed fatty acids prepared from a typical cod-liver oil by a brief saponification, removal of the nonsaponifiable matter by ether, acidification, and ether

extraction showed only relatively low absorption in the ultraviolet region, without fine structure ($E_{1\text{cm}}^{1\text{ percent}} 2,300 \text{ a. u.} = 6.5$). If, however, the time taken for the saponification were prolonged, or if the separated acids were boiled with a further supply of alcoholic KOH, the absorption became much more intense ($E_{1\text{cm}}^{1\text{ percent}} 2,300 \text{ a. u.}$ after 12 hr. = 72), and definite signs of fine structure became evident.

"From a biological standpoint our results may be of interest in opening up the possibility that highly unsaturated acids may exist in vivo in two forms, nonabsorptive and absorptive."

Interaction of halogenacetates and SH compounds: The reaction of halogenacetic acids with glutathione and cysteine; the mechanism of iodoacetate poisoning of glyoxalase, F. DICKENS (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1141-1151, figs. 9).—When neutral solutions of sodium iodoacetate and glutathione were mixed the resulting reaction followed the bimolecular law, eliminating iodide with the formation of a thio ether, the corresponding reaction with cysteine being thus represented:



The behavior of bromoacetate was similar but less vigorous, while that of chloroacetate was much less so; the respective velocity constants for the reaction at 38° C. were of the relative order, I:Br:Cl=15:9:0.15. With cysteine a similar reaction occurred, and the pure reaction product was prepared in good yield under conditions of reaction and temperature not very different from the physiological.

The iodoacetate inhibition of glyoxalase activity was reversed completely by the addition of glutathione to the inactivated extract, from which it is inferred that only the coenzyme of glyoxalase is inactivated by iodoacetate, the enzyme itself remaining undamaged. "The concentration of iodoacetate necessary to inhibit glyoxalase preparations depends on the method of preparation of the extracts. With crude undialyzed extracts high concentrations of iodoacetate (N/100) are necessary, while with the preparations subjected to thorough dialysis the amount of iodoacetate is nearly equivalent to the content of added glutathione, thus iodoacetate in about 10^{-4} M concentration or less may be sufficient to stop lactic-acid formation from synthetic methylglyoxal in the dialyzed extracts. This is of the same order of concentration as that found to inhibit the glyoxalase action of tissue slices, prepared and studied by Warburg's method. Hence it is once more shown that quantitative conclusions drawn from the behavior of extracts may be misleading when applied to the intact tissues. The concentration of iodoacetate needed to check the conversion of synthetic methylglyoxal into lactic acid by intact tissues is of the same order as that . . . required to stop the conversion of glucose into lactic acid by tissues."

The action of polyhydric phenols on urease: The influence of thiol compounds, J. H. QUASTEL (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1116-1122).—Of the three dihydric phenols, catechol and quinol were found exceedingly toxic to urease, but resorcinol was without action. Quinol at a concentration of 1 part in 2 millions reduced the activity of urease under the experimental conditions employed to less than 50 percent. Quinone is more toxic to urease than quinol. Evidence to show that the toxic effects of catechol and quinol are probably due to the presence of the corresponding quinones in the aqueous solutions of these dihydric phenols and that the protective action of thiol compounds is due to reduction of the quinone to the corresponding dihydric phenol is given. "The toxicity of catechol or quinol at concentrations as low as 1/100,000 is not affected by the presence of potassium cyanide or amino acids. This distinguishes the toxicity of catechol or quinol from that of metals or

that of dyestuffs. The presence of protein (serum or egg white) does not protect urease from catechol. Boiled egg white has a protective action (due probably to liberated thiol groups).

"Thiol compounds (cysteine, glutathione, thiolacetic acid, H_2S) and sodium hydrosulfite diminish or eliminate the toxicity of polyhydric phenols to urease."

"Adrenaline, protocatechuic acid, protocatechuic aldehyde, gallic acid, and pyrogallol are toxic to urease but less so than catechol. Phloroglucinol is without action." "Hydrogen peroxide and 'hyperol', though very toxic to urease, are less so than catechol."

The proteolytic enzymes of yeast, T. F. MACRAE (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1229-1236).—"The liberation of the proteolytic enzymes, dipeptidase, aminopolypeptidase, and proteinase by the autolysis of English top yeast and Dutch baker's yeast has been studied and has been shown to differ in several respects from the liberation of these enzymes from Löwenbräu yeast. Quantitative differences in the behavior of the enzymes from these sources to adsorbents and other treatment have also been observed."

Various methods for the preparation of dipeptidase, aminopolypeptidase, and proteinase from Löwenbräu yeast were found to require modification when used for the preparation of these enzymes from English top yeast. By means of modifications of these methods, preparations of (1) dipeptidase completely free from proteinase and containing only traces of aminopolypeptidase, and (2) aminopolypeptidase free from both dipeptidase and proteinase were obtained from English top yeast. Proteinase, free from dipeptidase but not from aminopolypeptidase, was obtained from English top yeast and Dutch baker's yeast.

Modifications in the absorption spectrum of vitamin A under the influence of irradiation [trans. title], A. CHEVALLIER and Y. CHORON (*Compt. Rend. Soc. Biol. [Paris]*, 115 (1934), No. 12, pp. 1297-1299, fig. 1).—With the apparatus previously described (*E. S. R.*, 70, p. 152) slightly modified to permit the cooling of the solution during the period of measurement, the authors have repeated their spectrophotometric measurements of vitamin A during prolonged irradiation.

In the first 15 min. the maximum absorption dropped from 3,280 $m\mu$ to 3,250 $m\mu$, but with almost no change in the form of the absorption curve. On prolonging the time the maximum absorption dropped to 3,200, 3,100, and 3,150 $m\mu$, and at the same time the slopes of the curves were considerably distorted. This is thought to indicate that in the destruction of vitamin A before reaching the state of β -ionone intermediate compounds are formed.

Isolation of oryzanin (antineuritic vitamin) from yeast, S. OHDAKE (*Imp. Acad. [Japan] Proc.*, 10 (1934), No. 2, pp. 95-98).—Following the same technic as in the earlier preparation of a concentrate of vitamin B_1 from rice polishings and studies of its chemical properties (*E. S. R.*, 69, p. 6), the author has isolated the vitamin from yeast in the form of hydrochloride, picrolonate, and chloraurate, with the conclusion that the antineuritic vitamin from yeast is identical with that from rice polishings, a sulfur-containing compound with the formula $C_{12}H_{10}N_4SO_2$.

The material used in preparing the concentrate was pressed baker's yeast which had been soaked in a vitamin B_1 -containing solution for 5 or 6 hr. with continuous passage of air through the solution, this procedure having been found to increase considerably the vitamin B_1 content of the yeast.

Isolation of oryzanin (antineuritic vitamin).—Third report, S. OHDAKE (*Bul. Agr. Chem. Soc. Japan*, 10 (1934), No. 4-6, pp. 71-76, figs. 2).—Noted above.

From irradiated ergosterol to crystalline vitamin D, according to the work of Bourdillon and of Windaus [trans. title], G. TANRET (*Bul. Soc. Chim. Biol.*, 15 (1933), No. 9, pp. 1346-1364).—An excellent historical review is given of the investigations of the authors noted in the title and their associates leading to the isolation of vitamin D in crystalline form. A bibliography of 17 titles is appended.

The technique of glass electrode measurements, B. S. PLATT and S. DICKINSON (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1069-1077, fig. 1).—A detailed description of the design and construction of a glass electrode system is given, the topics considered with particular care being the selection, preparation, and properties of the glass membrane, preparation of half cells, liquid-liquid junction potentials, standardization of the cell system, and the effect of temperature on glass electrode potential measurements.

"Careful temperature control is shown to be of considerable importance. Measurements made of the H-ion concentration of buffer solutions may show apparent acid and alkaline changes due to temperature variations. Reference is made to the importance of these factors in the interpretation of the so-called 'acid change' in blood."

A stainless steel high-pressure ultrafilter, S. J. FOLLEY and A. T. R. MATTICK (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1113-1115, figs. 5).—A high-pressure ultrafiltration apparatus constructed solely of stainless steel is described, constructional details being indicated in working drawings. Various applications of the apparatus are indicated.

The filter is connected through a needle valve and dust filter "to a nitrogen cylinder by means of a flexible copper pipe tested to a pressure of 5,000 lb./sq. in. It is quite safe to apply full cylinder pressure to the filter as it also is tested to 5,000 lb./sq. in. Filtration at 110 atmospheres through Seitz pads is very rapid, and even through Cellophane No. 300 about 100 cc per day of a 0.6 percent solution of bovine serum-albumin may be ultrafiltered."

The titration of dyes for their bacteriostatic action, M. V. REED and E. F. GENUNG (*Stain Technol.*, 9 (1934), No. 4, pp. 117-128).—The bacteriostatic power of crystal, gentian, and methyl violets and of malachite green and brilliant green with respect to the growth of cultures of *Staphylococcus aureus* and *Bacterium communior* was measured, with the results, in part, that of these triphenylmethane dyes the triamino derivatives (crystal violet, etc.) were found to have a bacteriostatic action upon the Gram-positive organism *S. aureus* at concentrations much lower than those effective in the case of the diamino derivatives (malachite green, brilliant green) upon the same organism. In the case of the Gram-negative *B. communior*, however, brilliant green (tetraethyl-diamino derivative) was most effective, followed by malachite green (tetramethyl-diamino derivative), the crystal violet group of dyes being much less inhibitive for this organism.

The need for a standardization of methods for estimating the bacteriostatic power of dyes is emphasized, as is also the observation that the determinations of the power of a dye to produce bacteriostasis in vitro do not determine its behavior in vivo.

A rapid method for the determination of total nitrogen in soil, E. M. EMMERT (*Soil Sci.*, 38 (1934), No. 2, pp. 139-142).—"To 0.2 to 1 g of finely ground dry soil (the sample should contain at least 0.5 mg of N) in a dry 20 by 150 mm test tube, add by means of a pipette exactly 1 cc of a 50 percent solution of sodium chlorate, placing the solution in the bottom of the tube without touching the sides. (Samples high in organic matter but low in nitrogen may require 2 cc of the chlorate solution.) Add exactly 3 cc of a 50 percent by volume solution of sulfuric acid. Shake the tube and heat the upper part of

the solution while shaking until the reaction starts, but not long enough to boil off water. Put the tube into boiling water in such a manner that the water comes to the top of the solution in the tube. Keep in the boiling water until the soil is completely oxidized (usually about 5 min., although a longer time will do no harm). The oxidation is complete when a clear yellow or brownish solution is present with a white to brownish silica residue which settles readily. Care should be taken that appreciable amounts of water are not lost from the tube, since this would make aliquoting inaccurate. Green fumes may appear, and a slight explosion may take place, but this does no harm. If foaming places some particles of the soil up on the sides of the tube, they should be returned into the solution by shaking and rotating.

"When it is certain the oxidation is complete, cool the solution in cold water and add, slowly at first, exactly 6 cc of 40 percent sodium hydroxide, cooling in cold water to prevent excessive heat. The solution should now be rather strongly alkaline. Filter and place 1 cc of the filtrate in another test tube. Add rather rapidly 2 cc of fuming sulfuric acid (15 percent SO_3) and shake and blow across the top of the tube until the chlorine is expelled and the solution is colorless. Boiling caused by the acid will do no harm here. Add a few drops more of the acid and note whether any more chlorine is liberated.

"When the solution is free of excess chloric acid, immediately add 1 cc of phenoldisulfonic acid. The solution should remain colorless except for the tinge which the phenoldisulfonic acid adds. If a yellowish tinge appears, excess chloric acid is still present, and off-color tints will appear. Another aliquot must be taken and treated as before, making certain all chloric acid is absent. If trouble is experienced in getting rid of chloric acid, heat the 1-cc aliquot nearly to boiling before adding the fuming sulfuric acid. After a few seconds wash the solution into a 200-cc Erlenmeyer flask with about 15 to 20 cc of water and neutralize with clear 40 percent sodium hydroxide until the maximum yellow color develops. Make to a volume which brings the color intensity fairly close to the standard used and compare in a colorimeter."

The author of this communication from the Kentucky Experiment Station has already described other quite similar chlorate oxidations (E. S. R., 65, p. 312). The recorded percentages of error in the nitrogen determination method here described range from +8.4 to -14.2.

A note on the determination of titanium in soils, J. S. JOFFE and L. T. KARDOS (*Soil Sci.*, 38 (1934), No. 3, pp. 241-243).—Sources of error or inconvenience met with in various forms of soil-analysis procedure are noted in a contribution from the New Jersey Experiment Stations, and the following modification of the usual procedure is suggested:

"The residue from the SiO_2 is fused with KHSO_4 , and the TiO_2 is determined. An aliquot of the HCl filtrate obtained in the process of stabilizing the SiO_2 is then taken, the R_2O_3 precipitated, ignited in a platinum crucible, weighed, fused with KHSO_4 , the TiO_2 determined, the figure for the TiO_2 multiplied by the aliquot factor, the result added to the figure on the TiO_2 in the SiO_2 residue, and the sum represents the total TiO_2 in the 5-g sample of soil."

A rapid method for obtaining protein-free ultrafiltrates of blood and plasma, C. WILSON and E. R. HOLIDAY (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1095-1098, fig. 1).—An apparatus for rapid ultrafiltration is described, together with methods for preparing collodion membranes with the object of removing proteins from blood, plasma, and serum for the isolation of various constituents. "The method is suitable (1) for obtaining rapidly small quantities of ultrafiltrate for inoculation; (2) for filtering large quantities."

Determination of iodine in blood, H. J. PERKIN (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1078-1081).—"A weighed amount of normal whole blood, up to 10 cc, is placed in a nickel crucible of 50-cc capacity, together with 2 g of potassium carbonate. . . . The crucible is placed directly in an electric muffle furnace heating to 500° [C.] in 30 min. Then the oven is adjusted to maintain this temperature, as indicated by a thermometer. Heating is continued for 4 hr. The charred mass is broken up and finely ground with a spatula, care being taken to retain every particle in the crucible. Depending on the amount of ash present, water is added to form a pasty mass such as will fall away from the side of the crucible. This paste is extracted with 95 percent alcohol 4 times, using 7 cc each time. The extracts are passed through a filter paper . . . , the filtrate being caught in a round-bottomed Pyrex dish of 30-cc capacity. This alcoholic solution is evaporated to dryness on an electric hot plate layered with asbestos, boiling being carefully avoided.

"The dry residue is now taken up with 1 cc of water and transferred to a tube of diameter 1 cm and length 2.5 cm, in which are placed 10 or 12 small capillary tubes sealed at the upper end. The solution is made slightly acid with 0.1 N H_2SO_4 , a microdrop of a saturated aqueous solution of methyl orange serving as an indicator. In order to oxidize the potassium iodide to iodate, 4 drops of a freshly prepared aqueous solution of bromine are added. The tubes are placed directly in contact with an electric hot plate. The capillary tubes insure regular and steady boiling. The solution is boiled for 1 min. Twenty sec. after the initiation of boiling, the yellow color of the bromine disappears. The tubes are immediately placed on ice. A small drop (0.02 cc) of a potassium iodide solution containing approximately 100γ of iodine is added. Iodine is liberated to 6 times the amount originally present. One drop of starch solution is added and the solution titrated to colorless, using 0.01 N sodium thiosulfate in a microburette. (One hundred and fifty divisions of thiosulfate from the microburette used were equivalent to 1.08γ of original iodine.)"

The use of some micro-organisms in sugar analysis, V. J. HARDING and T. F. NICHOLSON (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1082-1094).—Four out of a number of micro-organisms examined appeared useful as biological reagents for sugars.

A strain of *Proteus vulgaris* was found not to remove fructose, mannose, maltose, lactose, sucrose, arabinose, and xylose, but was variable in its action on galactose. "*Proteus* can be applied to Folin-Wu blood filtrates and to urines after treatment with H_2SO_4 and Lloyd's reagent and after treatment with $HgSO_4$ and $BaCO_3$." Details of the analysis of mixtures of glucose, fructose, and sucrose are given.

"*Monilia tropicalis* is extremely active in removal of maltose. A method for the estimation of maltose is given, depending on the use of *Saccharomyces marxianus*, followed by *M. tropicalis*. Baker's and brewer's yeasts show variation in their removal power toward maltose, depending on the freshness of the organism." A method using "aged" and "fresh" baker's yeast for the separation of glucose and maltose is suggested. "*M. krusei* is a useful sugar reagent, as it only removed glucose, fructose, and mannose."

A system of carbohydrate analysis, embracing glucose, fructose-mannose, galactose, sucrose, maltose, and lactose, is outlined, and the result of the analysis of such a mixture by the biological reagents is given. Some precautions in the use of organisms as analytical reagents for sugars are suggested.

Experimental work on cucumber fermentation, VI, VII, F. W. FABIAN and A. L. NIENHUIS (*Michigan Sta. Tech. Bul.* 140 (1934), pp. 27, figs. 11).—The bulletin contains two more papers of this series (E. S. R., 68, p. 731).

VI. *Factors influencing the formation of ropy brine in cucumber fermentation* (pp. 3-22).—Four samples of ropy brine yielded 13 cultures of bacteria, which were divided into two groups on the basis of their morphological, cultural, and physiological characteristics. Seven cultures consisted of short, motile (with one nonmotile exception), Gram-negative, encapsulated rods which did not ferment any of the carbohydrates tested. Six cultures consisted of bacteria which were motile, Gram-negative rods somewhat longer than those of the first group. Three members of this group were encapsulated. The various cultures are described.

The optimum conditions for the production of ropiness when these 13 cultures were inoculated into cucumber brine were determined with respect to acidity, salinity, and temperature. It was found that the cultures produced the greatest amount of ropiness in a brine having a low acidity and a low salinity. The ropiness likewise increased with a rise in temperature. The influence of dissociation on ropiness was also studied, the rough form of the two organisms studied producing little or no ropiness as compared with the smooth form.

"Attention is called to the fact that ropiness is most easily controlled by increasing the salt concentration about twice as fast as normal. The salometer should not be used to measure the salinity in ropy brine, due to the gross error in this method caused by the viscosity of brine as a result of the type of bacteria present."

VII. *Bacillus nigrificans* n. sp. as a cause of pickle blackening (pp. 23-27).—An organism which under suitable conditions produces blackening in pickle brine due to a water-soluble pigment has been isolated from samples of black pickle brine. The name given to this organism is *B. nigrificans* n. sp. The conditions necessary for blackening were found to be the presence of a carbohydrate, such as dextrose, the absence of an excessive amount of such nitrogenous material as peptone, and a practically neutral or slightly alkaline reaction of the brine.

Cider making on the farm, W. F. WALSH (*New York State Sta. Circ. 149* (1934), pp. 18, figs. 5).—The subject is covered in some detail from the selection of varieties, the blending of which will yield cider of good flavor through pressing, clarifying, and filtering to bottling and pasteurizing. The novel feature of the methods described is a direction for carbonating cider in the bottles by adding suitable quantities of solid carbon dioxide ("dry ice") to the chilled bottled cider, followed by sealing and pasteurizing.

Making cider vinegar on the farm, D. K. TRESSLER (*New York State Sta. Circ. 148* (1934), pp. 3).—This circular discusses very briefly the choice of varieties of apples, the effect of the stage of maturity at which the fruit is pressed, the fermentation and acetification processes and the conditions favoring satisfactory results in each of these two steps, and the preservation of the finished vinegar. Condensed directions for making cider vinegar on the farm follow this summary of the processes involved.

AGRICULTURAL METEOROLOGY

Weather, R. ABERCROMBY, rev. by A. H. R. GOLDIE (*London: Kegan Paul, Trench, Trubner & Co., 1934, rev. ed., pp. XII+274, [pls. 9], figs. [56]*).—In this new edition of a standard work, which first appeared in 1887, the subject matter has been thoroughly revised and largely rewritten. The new edition differs from the old "in containing an account of present-day knowledge of the upper air and in the prominence given at every stage to the application of physical principles in explaining the processes of weather." It is stated that the object of

the work is "to place before the general reader a short but clear picture of the science of which it treats." Brief references are made to practical applications to agriculture and industry.

Climate and the physical needs of plants: Means of comparison [trans. title], L. MONTLAUR (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 7, pp. 464-466, figs. 2).—A graphic method of defining the climatic factors determining the type of vegetation is described.

Relations between French vegetation and climate [trans. title], G. GOUJON (*Mem. Off. Natl. Mét. France*, No. 23 (1932), pp. 7+XVIII+186, figs. 59).—This is an exhaustive memoir dealing in some detail with continental, Atlantic, Mediterranean, and mountain influences as affecting particularly different types of natural vegetation in France, but also referring briefly to certain agricultural crops and crop adaptations.

A bibliography, vegetation charts, and an appendix giving a classification of conifers are given.

China rainfall and world weather, CHANG-WANG TU (*Mem. Roy. Met. Soc.*, 4 (1934), No. 38, pp. 99-117, figs. 6).—This paper gives the results of use of statistical methods to study the relation between the summer rainfall of China and the pressure, temperature, and rainfall of the world. Certain relationships are shown, and attempts are made to interpret the empirical results and to show their possible value in forecasting summer rainfall in China.

The sugar cane and weather, H. M. LEAKE (*Internatl. Sugar Jour.*, 36 (1934), Nos. 424, pp. 147-151, fig. 1; 425, pp. 183-185; 426, pp. 227-229).—Methods and results of work of various investigators on the subject are reviewed, and the relations of temperature, rainfall, humidity, light, and wind to the growth and quality of juice of sugarcane are discussed, particularly from the standpoints of economic conditions and improvement of quality and culture. The need for dual treatment of data by correlation and by the Fisher method of analysis is pointed out.

Monthly Weather Review, [May-June 1934] (*U. S. Mo. Weather Rev.*, 62 (1934), Nos. 5, pp. 149-179, pls. 8, figs. 6; 6, pp. 181-219, pls. 11, figs. 10).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 5.—Reduction of the Barometric Pressure over the Plateau to the 5,000-foot Level, by D. M. Little and E. M. Vernon (pp. 149-155); The Character and Magnitude of the Dense Dust-Cloud Which Passed over Washington, D. C., May 11, 1934, by I. F. Hand (pp. 156, 157); How a Commercial Pilot May Contribute to a Program of Air-mass Analysis by Observations Made during Flight, by L. P. Harrison (pp. 157-159); A Statistical Analysis of Fogs at Greensboro, N. C., Airport, by J. C. Scholl (pp. 159-162); Dust Storm of April 12, 1934, Baton Rouge, La., by R. J. and R. D. Russell (pp. 162, 163); Analysis of the Precipitation of Rains and Snows at Mount Vernon, Iowa, by N. Knight (pp. 163, 164); and Circulation in the Stratosphere over Brazil, by A. B. Serra (p. 164).

No. 6.—Climatic Characteristics of the Boulder Dam Region, by G. V. Sager (pp. 181-185); The Great Wind of April 11-12, 1934, on Mount Washington, N. H., and Its Measurement.—I, Winds of Superhurricane Force and a Heated Anemometer for Their Measurement during Ice-forming Conditions, by S. Pagluica (pp. 186-189); II, The Mount Washington, N. H., Heated Anemometer, by D. W. Mann (pp. 189-191); III, The Calibration of the Mount Washington, N. H., Heated Anemometer and the Analysis of Its Record of April 11-12, 1934.

by C. F. Marvin (pp. 191-195); Further Conclusions from Additional Observations in the Free Air Over San Diego, Calif., by D. Blake (pp. 195-199); Hourly Distribution of Rainfall at Mobile, Ala., by H. Armstrong (p. 200); Lightning Branches on the Ground, by R. H. Weightman (pp. 200, 201); Some Observations of the Sun through a Dust Storm, by C. T. Elvey (pp. 201, 202); and The Tropical Disturbance of June 5-23, by G. E. Dunn (pp. 202, 203).

Climatological data for the United States by sections, [May-June 1934] (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 21 (1934), Nos. 5, pp. [201], pls. 2, figs. 5; 6, pp. [202], pls. 2, figs. 5).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Temperature and precipitation map of the United States, J. S. GIBSON (*Jour. Geogr.*, 33 (1934), No. 6, pp. 237-240, fig. 1).—A map showing in graphic form the temperature and precipitation of each State, suitable especially for classroom instruction, is given and briefly described. This map is based on mean monthly and mean annual temperature and precipitation data for about 100 stations.

Meteorological observations, [July-August 1934], C. I. GUNNESS and F. SHAW (*Massachusetts Sta. Met. Ser. Buls.* 547-548 (1934), pp. 4 each).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

European meteorological organizations [trans. title], A. MELICCHIA (*Ricerca Sci. [Roma]*, 2 (1934), No. 3-4, pp. 71-84).—Meteorological organizations in Austria, Czechoslovakia, Poland, Danzig, Germany, Denmark, Sweden, Norway, Netherlands, England, Belgium, France, and Switzerland, and major features of their work are briefly described.

World weather records (*Smithsn. Misc. Collect.*, 90 (1934), pp. VIII+616; rev. in *Met. Mag. [London]*, 69 (1934), No. 823, pp. 171-173).—This is a supplement to Smithsonian Miscellaneous Collection 79 (*E. S. R.*, 57, p. 612), giving summaries of official meteorological observations from 1921 to 1930, collected by G. C. Simpson, R. C. Mossman, G. Walker, and F. L. Clayton, and assembled and arranged for publication by H. H. Clayton.

SOILS—FERTILIZERS

Application of the theory of probability to the size distribution of soil aggregates, C. AFFLECK (*Soil Sci.*, 38 (1934), No. 2, pp. 113-119, figs. 3).—By an application of the theory of probability the author of this contribution from the Utah Experiment Station has developed, in a mathematical discussion here fully presented, an algebraic equation for the most probable particle size distribution in the case of a homogeneous substance broken into fine particles by a random process. Because soils, instead of being composed of a homogeneous material, consist of "several kinds of material with different physical properties, each of which has a distribution curve of its own", the individual curves obtained cannot be made to fit actual soil distribution curves; however, by summing several terms of the type given it was possible to fit rather closely an experimental Trenton clay distribution curve, and "it is clear that by adding subsequent minor distributions a more precise fit may be obtained."

Soils of Pondera County: Soil reconnaissance of Montana.—Preliminary report, L. F. GIESEKER (*Montana Sta. Bul.* 291 (1934), pp. 62, fig. 1, maps 4).—This bulletin records a reconnaissance survey of this county, its area being 1,635.3 sq. miles. Located in the northwest part of the State, the county lies mostly in the drainage basin of the Marias River.

The soils are grouped in 19 soil series and 42 soil types, the most extensive single grouping being that of the Joplin loams, which were found to cover 9.8 percent of the area surveyed. Mountains were found to cover 8.9 percent, and 159.6 sq. miles of other types were so sharply rolling as to be unsuitable for agriculture.

Sandy soils: Methods of management, G. M. GRANTHAM and C. E. MILLAR (*Michigan Sta. Spec. Bul. 248 (1934), pp. 42, figs. 15*).—It is recommended that only the better grade of sandy soils should be selected for farming under present conditions.

"In order to conserve soil humus and reduce the cost of operation, sandy soils should be kept compact and should be plowed and tilled as little as is consistent with good seed bed preparation and proper weed control. Rotations should be arranged to include a comparatively large acreage of legumes, as alfalfa and clover, and the use of green manuring and cover crops in order to maintain the humus and nitrogen content of the soil and to reduce the loss of plant food by leaching. On most farms where the general or mixed type of farming is followed, as much livestock should be kept as can be fed very largely from the feed produced under a good soil management system. All farm manure should be handled in a manner to conserve plant food. Commercial fertilizers should be used to balance the plant food content of the manure and to supplement the supply of plant food in manure so that crops are adequately and properly fertilized. Marl, limestone, or other forms of lime should be used on sour soils to fit them for the growing of alfalfa and clover, to increase the efficiency of manure and commercial fertilizer, and to increase the yield of the most commonly grown crops."

Effect of burning on forest soils, H. A. FOWELLS and R. E. STEPHENSON (*Soil Sci., 38 (1934), No. 3, pp. 175-181*).—Nitrification in forest soils was found by the authors of this contribution from the Oregon Experiment Station to be stimulated by burning and the liberation of the basic ash materials. Burning and the increased nitrification thereby induced increase the soluble mineral nutrients in the soil "probably for some time after burning."

On the other hand, "burning destroys not only the organic matter on top of the soil but may destroy some of that in the immediate soil surface. The temporary effect of burning may be helpful . . . in some respects, but, since the productivity of the forest soil depends upon gradual mineralization of the fallen litter, it does not appear reasonable to expect continuous and often repeated burning to improve forest soil fertility."

The carbon : nitrogen ratio in relation to soil classification, M. S. ANDERSON and H. G. BYERS (*Soil Sci., 38 (1934), No. 2, pp. 121-138*).—In a contribution from the Bureau of Chemistry and Soils, U. S. D. A., the authors studied the available data on the carbon:nitrogen ratio of soils with reference to their classification in the great soil groups. In each group the ratio decreased with depth, though this decrease was "neither uniform nor absolutely general." The mean nitrogen content of the surface soils of each of the great soil groups is stated. Some further observations were that "the variations of the carbon:nitrogen ratio are so wide as to make the determination of nitrogen wholly useless as means of estimation of either carbon or organic matter. The data indicate a wide variation in the ratio between the great groups and also a highly variable ratio in different soils within each group. The most constant ratio is found in the chernozem group. It is more variable in the prairie group and becomes erratic in the other groups." The possible and probable factors determining the magnitude of the ratio are discussed, and the conclusion is

reached that the results indicate "an essential difference in the organic matter of the different groups."

Laws of soil colloidal behavior.—XV, Ionic exchange with hydroxides, A. J. PUGH (*Soil Sci.*, 38 (1934), No. 2, pp. 161-173, figs. 9).—The influence of pH on the adsorption of oxalate and sulfate ions by various hydroxides was determined in the experiments upon which the present paper of this serial contribution (E. S. R., 71, p. 593) from the New Jersey Experiment Stations is based, and the observed adsorption was correlated with the isoelectric pH of the compounds. The lower the pH the greater was the adsorption of anions. This adsorption diminished with increasing pH and reached a low value at the isoelectric pH. "With the adsorption of the oxalate ion by aluminum and titanium, a secondary effect of diminished adsorption at low pH values was observed. This did not occur with the sulfate, and hence solubility is an important secondary reaction in ionic exchange reactions with colloids. The point of exchange neutrality is independent of the concentration or the age of the colloid and of the salt used insofar as determined with solutions of oxalate and sulfate salts of different concentration."

Anion exchange.—I, Adsorption of the phosphoric acid ions by soils, S. RAVIKOVITCH (*Soil Sci.*, 38 (1934), No. 3, pp. 219-239, fig. 1).—From the experiments detailed the author infers that "in the H soils there are four distinct groups representing four definite forms of adsorption. The amounts of adsorbed PO_4 for these four forms are equal in milliequivalents to about 1, 1.5, 2, and 2.5 times the exchange capacity of the soil sample, respectively. For the Ca soils five forms of adsorption are established. The amounts of adsorbed PO_4 for them are equal in milliequivalents to about 1.5, 2, 2.5, 3, and 3.5 times the exchange capacity of the soil sample, respectively. These quantities are true only for soils the complex of which is completely saturated with calcium." The differences in behavior among soil: phosphate solution systems of various phosphate concentrations, on the basis of which the various types of adsorption are postulated, are considered in detail.

Some other observations were that with comparatively high concentrations of the ammonium phosphate solutions the adsorption both for the H soils and for the Ca soils becomes negative. In all forms of adsorption for H soils the proportion of adsorbed PO_4 was altered by changes in the pH value of the solution. On the other hand, "the changes in pH between slight acidity and high alkalinity exert no influence on the PO_4 adsorption by Ca soils, by soils unsaturated with calcium to a certain degree, nor by soils the amount of exchangeable calcium of which exceeds the exchange capacity of the soil, established at pH 7.0. This statement is true when the adsorption proceeds only according to the first form for Ca soils. In the soils partially saturated with calcium, where the adsorption proceeds partly according to the first form for H soils and partly according to the first form for Ca soils, the amount of adsorbed PO_4 is influenced by the pH."

Soil profile studies.—VI, Distribution of titanium in soils with special reference to podzols, J. S. JOFFE and A. J. PUGH (*Soil Sci.*, 38 (1934), No. 3, pp. 245-257).—In the present installment of this serial contribution from the New Jersey Experiment Stations (E. S. R., 70, p. 13), data on the titanium dioxide content of soils in the various parts of the world are recorded as showing that the distribution of titanium dioxide within the soil profile varies with the soil zones. It appeared that in general the titanium dioxide behaved as an ampholyte somewhat as do the sesquioxides. In the laterites the titanium dioxide accumulates in the surface horizon. Similar tendencies in the podsollic soils are noted.

"Data on the TiO_2 content in podsol and podsollic soils show that the TiO_2 is not mobile to any large extent. Comparisons of the TiO_2 content in the respective horizons in the profile bring out clearly that this constituent accumulates in the profile. Within the profile in the soils of the podsol zone there is an accumulation of TiO_2 in the B and sometime in the A_2 horizons." The probable reactions in the light of the isoelectric precipitation of titanium dioxide in the lateritic and in the podsol process of soil formation are discussed, as are also data on the titanium dioxide content in the colloid fractions of the surface soils and subsoils in several soil zones. It is indicated that in the zone of the yellow earths and red loams, the transition zone between the podsol and laterites, there is an accumulation of titanium dioxide in the colloids of the surface soil, whereas in the podsollic and degraded chernozem zones there is an accumulation of titanium dioxide in the colloids of the subsoil.

Microbial activities in soil.—I, Nitrogen fixation by *Azotobacter* and activity of various groups of microbes in Palouse silt loam, S. C. VANDECAVEYE and B. R. VILLANUEVA (*Soil Sci.*, 38 (1934), No. 3, pp. 191-205, figs. 3).—Report is made in a contribution from the Washington Experiment Station on laboratory observations of nitrogen fixation in 1,500-g samples of three different Palouse silt loam soils treated with lime and carbonaceous organic residue and of the comparative activity of *Azotobacter*, total bacteria, fungi, and cellulose-decomposing bacteria in these soils as affected by added carbonaceous organic material, reaction, and nitrogen and organic matter content.

"The quantities of nitrogen . . . varied with the organic matter content of the soils. On the basis of 2,000,000 lb. of dry soil, the gain in total nitrogen ranged from 36 lb. for the soil with an original organic carbon content of 1.47 percent to 1,064 lb. for the soil with an original organic carbon content of 2.87 percent. Nitrogen fixation was greatly stimulated in three of the four soil samples which had received large amounts of carbonaceous organic residue.

"The total nitrogen content of the soil, the nitrogen:carbon ratio of the organic matter, or the comparatively large quantities of nitrate nitrogen present in the soils while atmospheric nitrogen fixation was in progress did not seem to affect the activity of *Azotobacter* to any appreciable extent. In the presence of available nitrogen, the fungi and bacteria were first to make use of the readily available organic compounds either originally present in the soil or supplied by additions of carbonaceous organic material. The activity of *Azotobacter* became most intensive after this readily available supply of organic compounds was exhausted, and apparently these organisms were capable of utilizing compounds that are not readily available for fungi. The activity of cellulose-decomposing bacteria was comparatively small and did not seem to have any significant bearing upon the activity of *Azotobacter*. The transformation of organic residue was associated with a distinct sequence in development of important groups of soil microbes through which the process of nonsymbiotic aerobic nitrogen fixation appeared to be directly affected. The activity of bacteria, *Azotobacter*, and cellulose-decomposing bacteria was not materially affected by soil reactions ranging between the pH values of 5.5 to 8.1, whereas the development of fungi was greatly retarded when the H-ion concentration was at pH 8.1 and slightly favored when it was at pH 5.5."

Available food supply, "and possibly also the nature of the inherent soil characteristics", appeared to have more effect on the activity of the soil microflora than soil reaction, this reaction being assumed to be within the limits generally occurring in most cultivated soils.

Newer aspects of nitrification, I, G. GOPALA RAO (*Soil Sci.*, 38 (1934), No. 2, pp. 143-159, figs. 2).—The present paper is devoted to the discussion of the con-

siderable direct and indirect evidence which the author has been able to collect in favor of the photochemical view of nitrification in the soil. He has found that not only ammonium salts but also aqueous solutions of urea, acetamide, hydroxylamine hydrochloride, hydrazine hydrochloride, ethylamine, methylamine, etc., are oxidized to nitrite in sunlight under suitable conditions. Urea, acetamide, and some other substances are first converted into ammonia under the action of light, and then this ammonia appears to be oxidized to nitrite. This view is based on experiments on the photochemical oxidation of ammonia and its salts, and other nitrogen compounds, in sunlight in the presence of such photosensitizers as titanium dioxide, aluminum trioxide, zinc oxide, and cadmium oxide.

Influence of temperature on bacterial nitrification in tropical countries, S. P. TANDON and N. R. DHAR (*Soil Sci.*, 38 (1934), No. 3, pp. 183-189).—The authors of this contribution from the University of Allahabad, India, find that the optimum temperature for the nitrite-forming organisms in tropical soil is 35° C. (95° F.), as against 25° observed in the soil of temperate countries. However, "the soil temperature in tropical countries in summer markedly exceeds the optimum temperature for bacterial nitrification and may even be greater than the maximum temperature at which the nitrite-forming bacteria can exist. Hence in summer, nitrification in tropical soil cannot be mainly due to bacteria." Since the nitrate content of the soil is at a maximum in summer, and "most of the bacteria are likely to be killed by the high temperature prevailing in the soil", it is concluded that light plays an important role in nitrification in soil.

The velocity of bacterial nitrification was found to be greater in the presence of calcium carbonate than in the presence of magnesium carbonate.

Physiological studies on Rhizobium.—II, The effect of nitrogen source on oxygen consumption by *Rh. meliloti*, *Rh. trifolii*, and *Rh. phaseoli*, R. H. WALKER, D. A. ANDERSON, and P. E. BROWN (*Soil Sci.*, 38 (1934), No. 3, pp. 207-217, figs. 7).—In continuation of this serial contribution from the Iowa Experiment Station (E. S. R., 71, p. 600), the authors report experiments with other species of the genus similar to those already performed upon *R. leguminosarum*. The work here recorded was concerned with the effects of various nitrogen sources on oxygen consumption in *R. trifolii*, *R. meliloti*, and *R. phaseoli*. "The results indicate that, in general, oxygen consumption and, therefore, growth of *R. trifolii* and *R. phaseoli* are affected in the same manner as in the case of *R. leguminosarum*. On the other hand, it seems that *R. meliloti* reacts entirely differently to the compounds of nitrogen, ammonium chloride, sodium nitrate, urea, and alanine, but in about the same manner to the yeast extract, which is a complex material containing only about 7.6 percent nitrogen.

"The reason for this physiological difference in the organisms of the different species has not yet been explained satisfactorily. Neither is it known whether, after a statistical analysis of physiological reactions of several species, the same general conclusions could be applied to the species as a whole, or whether certain reactions could be definitely linked with the efficiency of certain strains of the organisms in fixing nitrogen symbiotically." Further work on these points is in progress.

A blue stain for microorganisms in humus and in soil, L. G. ROMELL (*Stain Technol.*, 9 (1934), No. 4, pp. 141-145).—To improve color contrast between soil micro-organisms stained in accordance with the method devised by Conn (E. S. R., 60, p. 20), search was made for a blue dye to replace the pink stains of the fluorescein group. It is shown by a consideration of the combined effects of the absorption bands involved that dyes of greenish blue hue, even

if perfectly selective, cannot give satisfactory color differentiation in the presence of the humus colors. Among blue dyes having suitable absorption maxima, fast acid blue R (C. I. 760) was found decidedly the most satisfactory. It is suggested that a didymium glass may serve as a contrast light filter if such a filter be needed.

The effect of potassium on the production of proteins, sugars, and starch in cowpea and in sugar beet plants and the relation of potassium to plant growth, G. JANSSEN and R. P. BARTHOLOMEW (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 9, pp. 667-680, figs. 2).—This contribution from the Arkansas Experiment Station presents in full the data and conclusions of work already briefly summarized (E. S. R., 66, p. 513).

A review of the patents and literature on the manufacture of potassium nitrate with notes on its occurrence and uses, C. W. WHITTAKER and F. O. LUNDSTROM (*U. S. Dept. Agr., Misc. Pub. 192* (1934), pp. 54).—"Present methods and processes are adequate for the production of potassium nitrate for ordinary purposes, but to date no process has produced this material cheaply enough for general fertilizer use. It is doubtful if any process could have produced it cheaply enough for such use prior to the decline in price of nitrate nitrogen that followed the wide-spread adoption of synthetic ammonia processes. The present situation is, however, very different, and the interest in potassium nitrate production has increased greatly in recent years, as is evidenced by the large number of recent patents on the subject. . . . The final solution probably lies in those processes which utilize nitric acid or oxides of nitrogen and potassium chloride."

A classified list of patents is appended, together with more than 60 references to general sources of information on potassium nitrate and its preparation and uses.

AGRICULTURAL BOTANY

Economic plants, E. E. STANFORD (*New York and London: D. Appleton-Century Co., 1934*, pp. XXIII+571, figs. 376).—According to the author, this volume is intended to give a brief survey of several of the more important groups of plants and plant products utilized by the human race. A large amount of information is compiled and presented in a popular manner regarding the botanical origin and distribution, economic value, and methods of collecting or growing, preparing, and using these products in modern practice. Two chapters are devoted to a brief review of the plant kingdom and of plant cells, tissues, and organs. Forest products are then discussed, chiefly with reference to the United States, including not only different kinds of wood but also resins, tanning materials, and cork. An entire chapter is devoted to rubber and other latex products. A chapter on textile plants and products treats of cotton, flax, hemp, jute, and other fibers. Paper making and the sources of pulp, as well as its preparation, are presented. The chapters on food products are introduced by a brief discussion of the principal food classes and a survey of the different agricultural regions of the United States. After dealing with the different cereals of this country, a chapter is devoted to sugar sources, another to the nonvolatile or fixed oils derived from plants, a third to the chief protein-yielding plants, such as leguminous plants and nut-bearing trees, and a fourth to the rosaceous fruits, citrus fruits, and grapes. A chapter is given to the chief spices used in the United States and to some of the aromatic oils and camphor. A chapter on beverage-yielding plants, such as tea, coffee, and cacao, is followed by a concluding chapter on medicinal plants, with a discussion of some important drugs.

The book is well illustrated and provided with many instructive charts, maps, and tables from authoritative sources to indicate such facts as the distribution and economic importance of many of the plant products included.

Plant material introduced by the Division of Foreign Plant Introduction, Bureau of Plant Industry, July 1 to September 30, 1932 (*U. S. Dept. Agr., Inventory 112 (1934), pp. 29*).—Here 690 lots of plant material introduced for testing in different parts of the United States are listed, with descriptive notes, and indexed.

Experimental investigations on the relations between soil moisture and the use of water by plants [trans. title], H. PETERHÄNSEL (*Bot. Arch., 36 (1934), No. 1-2, pp. 99-151, figs. 10; Eng. abs., pp. 149, 150*).—The results are reported of studies conducted near Leipzig dealing chiefly with the relation between water absorption and the moisture content of the soil for winter rye, winter barley, winter wheat, summer barley, summer wheat, oats, alfalfa, and red clover. A special type of soil borer, devised for the work, is described. Nine thousand samples of soil were taken, and the moisture changes in the different plats were determined at intervals throughout the growing period. It was found that the moisture taken by the investigated plants was withdrawn chiefly from the top 40 cm of the soil.

Every time soil moisture determinations were made, the transpiration rates of the plants in each plat were also determined by the wilting method of Arland (*E. S. R., 64, p. 526*). For this purpose representative plants in each plat were pulled up, the root systems dipped in a melted paraffin and oil mixture to prevent evaporation from the normally underground parts, and the bundled plants weighed, after which the plants from all plats were hung up separately in the open at approximately the same time and under approximately similar conditions for a uniform predetermined period (in Arland's original procedure this did not exceed $\frac{1}{2}$ hr.). At the end of this period the plants were immediately taken down and weighed to determine the total water loss that had taken place in each lot. From this was determined the average absolute water loss per plant in unit time for the different species of plants. Then by calculating the number of plants per acre, the absolute transpiration rate per acre for the different kinds of crops could be determined and compared. The absolute moisture loss per plant having been determined, the relative transpiration rate per 100 g of green plant weight was also readily determined for the different species of plants.

It was found that only the absolute transpiration figures disclosed the comparative weight of water removal per unit area by the plants. The relative transpiration data, however, gave evidence of the specific ability of a given plant variety to protect itself, by limiting transpiration, against death from insufficient moisture. The author states that drought resistance and water used by plants do not always run parallel, and that a naturally drought-resistant variety may at times take much water out of the soil.

Water absorption and capacity for resistance to drought were greatly influenced by the developmental cycle in the different crops studied. Early maturing varieties were, for the most part, more resistant to drought than late maturing ones, not so much by reason of shortness of the growing period and consequent lesser water consumption as by reason of their capacity for energetic growth in spite of a lower relative transpiration. Such rapid vegetative development was followed at times by a high rate of water absorption, in spite of which a low relative transpiration rate was able to produce great drought resistance.

The results of the work, which are reported in detail for each type of crop investigated, contribute much to the elucidation of the important question of water economy in plants.

Factors affecting the distribution of iron in plants, C. H. ROGERS and J. W. SHIVE (*Plant Physiol.*, 7 (1932), No. 2, pp. 227-252, figs. 8).—In the work on this problem at the New Jersey Experiment Stations, plants of *Oxalis repens*, *Rumex acetosella*, *Solanum tuberosum*, *Glycine max.*—*Trifolium repens*, and *Zea mays* were grown in the field or in artificial media. Some of these have naturally very high pH values and others very low pH values for the tissue fluids. Samples of stems and leaves were collected at 4-hour intervals on clear days and the following nights. A portion of each was used for dry weight and total Fe determinations and another portion for sap extraction, after freezing, for pH and soluble Fe determinations. Freehand sections were subjected to microchemical pH and Fe tests.

It was found that plants which yield composite tissue fluids having high pH values in general show very low soluble (filtrable) Fe content but high total Fe content, and vice versa. In plants with tissue fluids of very high pH, slight fluctuations in pH value were met with, due to changes in light intensity, and corresponding fluctuations in the opposite direction were noted in the soluble Fe content. The range of pH values over which Fe appears to precipitate in plants of different species is wider than the corresponding range for inorganic systems.

The highest pH values of specific tissues for each species studied occurred in the phloem, with cortex only slightly lower, and the lowest pH in the xylem. Fe accumulations usually occurred in high pH tissues lying adjacent to relatively low pH tissues with a steep pH gradient between.

It was concluded that this Fe is in a precipitated form and not available for plant processes. No Fe accumulations were found in plants with low pH tissues throughout. In these plants the Fe content is low and uniformly distributed in practically all of the tissues. The xylem was found to provide the main channels of Fe translocation from the roots to the leaves.

On potato catalase, H. H. BUNZELL and M. B. KENYON (*Bul. Torrey Bot. Club*, 60 (1933), No. 7, pp. 469-474, figs. 2).—Catalase content of various parts of the potato plant at different stages of development was determined by the Bunzell method (*E. S. R.*, 71, p. 590). Catalase activity of the foliage is greater than of the tubers of the same plant. The catalase content of the foliage increases with the growth of the plant, while oxidase activity decreases. Throughout the principal period of growth the catalase activity of the juice of tubers remains fairly uniform. There is strong indication that catalase activity and oxidase activity are reciprocally related.—(*Courtesy Biol. Abs.*)

Vegetation and reproduction in the soy-bean, S. AUSTIN (*Science*, 78 (1933), No. 2025, pp. 363, 364).—Under normal seasonal conditions growth in soybean plants was found to cease simultaneously, accompanied by decrease in the percentages of K and moisture, whether fruiting had been prevented by removing the flowers or not. The only difference was that exflorated plants showed abnormal carbohydrate storage. Fruiting did not deplete N or mineral reserves.

It is held that since the soybean is a photoperiodic plant the shortening of day length probably not only initiates reproduction but also curtails vegetative processes. The evidence indicates that old age and death in the soybean are due to circumstances which accompany the reproductive phase but are not the direct result of it.

GENETICS

Cytological studies on some important meadow grasses with special attention to structural variations in the chromosome complement [trans. title], G. RANCKEN (*Acta Agr. Fennica*, No. 29 (1934), pp. 97, pls. 2, figs. 68; *Finn. abs.*, pp. 93-96).—The somatic chromosomes and chromosome behavior during meiosis, especially with regard to fragments, chiasmata, rings, and chains in *Festuca (elatior) pratensis*, *Alopecurus pratensis*, *Poa pratensis*, and *Dactylis glomerata*, are described and discussed in German. An extended table shows the occurrence of fragments in mitosis and meiosis reported for numerous plant species by different authors.

Interspecific and intergeneric hybrids in herbage grasses: Initial crosses, T. J. JENKIN (*Jour. Genet.*, 28 (1933), No. 2, pp. 205-264).—Certain features of combinations involving species of *Lolium*, *Festuca*, *Glyceria*, *Dactylis*, and *Arrhenatherum*, especially as to seed setting and the obtaining of established plants, are described from studies at the Welsh Plant Breeding Station, with extended discussion of the results in relation to spontaneous crossing, taxonomy, chromosome numbers, and phylogeny.

Genetics of red clover (*Trifolium pratense* L.), compatibility, I, R. D. WILLIAMS and R. A. SLOW (*Jour. Genet.*, 27 (1933), No. 2, pp. 341-362).—Occurrence of intrasterile interfertile classes was demonstrated within red clover families derived from the mating of pairs of self-sterile individuals. As in *Nicotiana* and other genera mentioned, self- and cross-incompatibility in red clover appeared to be controlled by an extensive series of at least seven sterility allelomorphs which render pollen bearing any one factor nonfunctional on a plant including the same gene in its constitution, by reason of inhibited growth of the pollen tube. A noninhibitory self-fertility allelomorph was shown to exist.

Chromosomes involved in a series of interchanges in maize, E. G. ANDERSON and I. W. CLOKEY (*Amer. Nat.*, 68 (1934), No. 718, pp. 440-445).—The 14 chromosomal interchanges reported were isolated from X-rayed corn (semi-sterile lines) at the California Institute of Technology.

Linkage relations of the A_2a_2 factor pair in maize, M. T. JENKINS (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 719, 720).—The A_2a_2 factor pair concerned with the production of anthocyanin pigment in corn (E. S. R., 67, p. 515) seemed to be located in the $Pr-V_2$ linkage group, with a cross-over percentage between bt and a_2 of 7.2, the order of the genes being $pr-bt-a_2$. Selective action in favor of pollen carrying A_2 over that carrying a_2 was apparent.

The inheritance of petal colour in gram (*Cicer arietinum* Linn.), A. R. KHAN and A. R. AKHTAR (*Agr. and Livestock in India*, 4 (1934), No. 2, pp. 127-155, pls. 2).—Experiments involving five crosses among Pusa types of gram (E. S. R., 66, p. 630) showed that blue color of flowers depends upon the factor B and that pink is produced by P in the presence of B . In the absence of B , the flower is white whether P is present or not. Greenness in the standard develops in the absence of W , being recessive to nongreen. Singleness depends upon S and is dominant to doubleness. The technic of crossing is described briefly.

Crossing over in *Nicotiana* species hybrids, D. KOSTOFF (*Cytologia*, 5 (1934), No. 3, pp. 373-377).—Several cases are described.

Studies on the inheritance of tuber colour in potatoes, W. BLACK (*Jour. Genet.*, 27 (1933), No. 2, pp. 319-339).—Factorial explanation of the production of reddish purple and bluish purple tuber skin color, based on results in genetic

studies at the Scottish Plant Breeding Station involving a number of potato varieties and selections, employs a basic factor *D*, unable alone to produce pigment; *R*, which cannot alone produce color, but gives a red color in the presence of *D*; *H*, an inhibitor, incompletely dominant when heterozygous to either *D* or *R* when one of them is homozygous, or, when homozygous, incompletely dominant when both *D* and *R* are homozygous; *P*, a blue producing factor, functioning only in the presence of both *D* and *R* and reacting similar to *R* to the presence of *D* and *H*; and *B*, a second factor for blue, resembling *P* in effect.

Inheritance of albino and white-striped characters in rice, S. K. MITRA and P. M. GANGULI (*Indian Jour. Agr. Sci.*, 4 (1934), No. 3, pp. 537-545, pls. 2).—Behavior of both natural and artificial hybrids suggested that inheritance of white-striping is Mendelian, and not more than two factors are involved. A factorial explanation is that the plant will be green in the presence of *G*, with *W* without *G* it will be white-striped, and in the absence of both factors an albino.

Chromosome numbers in the genus *Saccharum* and its hybrids, T. S. N. SINGH (*Indian Jour. Agr. Sci.*, 4 (1934), No. 2, pp. 290-294, pls. 3).—Cytological studies on material at the Coimbatore Imperial Sugarcane Station showed a range from 27 to 64 bivalents in six wild *Saccharums*; *Vellai* (40) × *S. narenga* (15)=34 bivalents; *Shakarchynia* × *S. spontaneum* (32)=47 bivalents; P. O. J. 2725 (106) × *Sorghum durra* (10)=58 bivalents; and Co. 213=59 bivalents. A striped sport of Co. 213 had 62 bivalents, and it gave rise to three distinct bud sports with 46, 58, and 59 bivalents, respectively.

The segregation of heteromorphic homologous chromosomes in pollen mother-cells of *Triticum vulgare*, C. L. HUSKINS and J. D. SPIER (*Cytologia*, 5 (1934), No. 3, pp. 269-277, pl. 1, figs. 13).—Study of three wheat plants with heteromorphic bivalents showed that a heteromorphic bivalent having one terminally and one medianly attached chromosome always segregates reductionally in the first meiotic division. Two heteromorphic bivalents with submedian attachments on each chromosome sometimes separate equationally in the first division. The spindle attachment was shown to remain unchanged. The hypothesis that sister chromatids are associated at the spindle attachment and that equational first divisions are due to crossing-over was in full accord with the observations.

Cultivated apple chromosomes, M. V. ROSCOE (*Science*, 80 (1934), No. 2069, p. 186).—Baxter, Kinkead, Mann, Mother, Opalescent, and Rolfe apples were found in studies at Acadia University to possess 17 haploid chromosomes, thus placing these varieties in the diploid group.

The origin of the plants of maternal type which occur in connection with interspecific hybridizations, E. M. EAST (*Natl. Acad. Sci. Proc.*, 16 (1930), No. 6, pp. 377-380).—From a cross made at Bussey Institution between *Fragaria vesca* with 7 and *F. virginiana* with 28 haploid chromosomes there was derived in addition to various hybrids one plant resembling the *F. vesca* maternal parent except in color of fruit, which was red instead of the parental white. This plant had 14 diploid chromosomes and was completely fertile. That it was not a mutation of *F. vesca* was indicated in various minor *F. virginiana* characteristics besides color.

A novel type of hybridity in *Fragaria*, E. M. EAST (*Genetics*, 19 (1934), No. 2, pp. 167-174, figs. 2).—A further study of the diploid seedling discussed in the foregoing paper showed it to possess definite *F. virginiana* characteristics as well as red color of the fruits. The center leaflet was dentate only halfway to the petiole in contrast to three-fourths the distance in the case of *F. vesca*.

Also the new clone exhibited marked heterosis and displayed considerably more pollen abortion than either parent. Marked variability observed in 18 F_2 plants, such as triploidy, nonblooming, and sterility, gave further evidence of hybrid origin. The explanation is offered that in the original cross the 7 haploid chromosomes of *F. vesca* combined with one set of 7 of the 28 in the *F. virginiana* gamete, and that the remaining 21 chromosomes were extruded in the cytoplasm and lost. In the F_2 gene combinations were not so successful, with the result that certain seedlings were unable to blossom and others that blossomed were completely sterile.

Principles of banana breeding, E. E. CHEESMAN (*Trop. Agr. [Trinidad]*, 11 (1934), Nos. 6, pp. 132-137; 7, pp. 176-181; 8, pp. 203-209).—A general review is presented of banana-breeding activities carried on by the Imperial College of Tropical Agriculture, Trinidad, since its inception as the West Indian Agricultural College in 1922. On the working hypothesis of 11 basic chromosomes in the banana, it has been established (1) that fertile *Eumusa* species such as investigated were diploid, (2) that the majority of edible bananas are triploid with a few diploids, (3) that tetraploids may arise from pollination of triploids by diploids, (4) that some tetraploids have the general habit and characters of commercial varieties, (5) that tetraploids are generally more fertile than corresponding triploids, (6) that tetraploids \times diploids may give rise to triploids, and (7) that polyploids may arise in later generations from crosses between distinct diploid species. It is believed that triploids of commercial value may be produced by synthesis from diploids or by reduction from tetraploids.

Chimera in dates, V. H. W. DOWSON (*Trop. Agr. [Trinidad]*, 11 (1934), No. 8, p. 209).—A record is presented of a chimera in the Lului date observed in a garden in Iraq. Commonly of a deep yellow lemon color in the stage observed, the chimera showed carmine as a mutant.

Chromosome fragmentation in *Lilium tigrinum* Ker., J. E. SASS (*Amer. Nat.*, 68 (1934), No. 718, pp. 471-475, figs. 15).—Lagging of one or more pairs of chromosomes observed at the anaphase of both divisions of meiosis in the pollen mother cells was followed by fragmentation as a result of girdling of the lagging chromosomes by the partition wall.

A hereditary lethal muscle contracture in cattle, F. B. HUTT (*Jour. Heredity*, 25 (1934), No. 1, pp. 41-46, fig. 1).—An abnormality in calves, involving extreme rigidity of the cervical muscles and limbs, is described in a contribution from the Minnesota Experiment Station. Five affected calves occurred in 3 herds, but all calves were sired by the same bull and 4 of the dams were either daughters or closely related to this bull. The fifth dam was probably related. The character which permitted the calves to be alive at term, but which was lethal, was evidently due to a simple recessive factor.

Attention is called to the injury resulting to some of the dams. The occurrence of similar or identical abnormalities in Norway, Sweden, and the State of New York is noted.

Inheritance of foot length, C. V. GREEN (*Jour. Heredity*, 24 (1933), No. 11, pp. 440-442, fig. 1).—In continuing the studies of inheritance of size in relation to color factors in the cross between *Mus bactrianus* and *M. musculus* (E. S. R., 70, p. 759), measurements are reported on the length of the hind feet in back-cross and F_2 individuals. In the black-cross offspring differences in foot length between brown and black individuals averaged 6.4. The probable error observed substantiates earlier suggestions regarding linkage relationship between brown coat color and size. A similar tendency was suggested, although to a lesser extent, in the F_2 population.

Hereditary variations in the gestation period of the rabbit, P. D. ROSAHN, H. S. N. GREENE, and C. K. HU (*Science*, 79 (1934), No. 2058, pp. 526, 527).—Significant differences between breeds were found for the length of the gestation periods in 569 pregnancies of 11 breeds and strains. Variance between breeds was significantly greater than that within breeds, even after eliminating the albinos from the analysis. The average gestation periods in the different strains ranged from 30.37 days in the Polish to 32.89 in the albinos. This suggests the operation of hereditary factors on the length of the gestation period in the different breeds. Seasonal differences were not significant. The gestation period appeared to be related to live weight and size of litter.

Progeny testing in breeding for egg production, M. A. JULL (*Poultry Sci.*, 13 (1934), No. 1, pp. 44-51).—Based on a discussion of egg production of progeny of selected sires and dams at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., it is pointed out that the daughters of different sires varied significantly, whereas the daughters of other sires did not show significant differences. In other matings the sires' progeny differed as regards this performance, depending on the dam to which the sire was mated. Other variations in the egg records of related individuals were noted, and the importance of repeating matings which have given high-producing progeny is emphasized.

Breeding a low-producing strain of Single Comb White Leghorns, G. O. HALL (*Poultry Sci.*, 13 (1934), No. 2, pp. 123-127).—An account is given of low- and high-producing flocks of Single Comb White Leghorns which were started in 1913 at the [New York] Cornell Experiment Station. No outside blood was introduced in the low-producing line after 1917.

The data given on the average egg production, days to maturity, fertility and hatchability of eggs, and egg weight and body weight for the high- and low-producing lines of birds are taken to indicate that in the low line there was no significant difference for any of these characteristics beyond seasonal variations during the period 1917 to 1933. It is considered by the author that the birds in the low line were, according to Hays' theory of the inheritance of egg production (E. S. R., 63, p. 266), of the genetic constitution *eee'e'WW rrr'r'aacpp*.

Inheritance of abnormal anatomical condition in the tibial metatarsal joints, P. J. SERFONTEIN and L. F. PAYNE (*Poultry Sci.*, 13 (1934), No. 1, pp. 61-63).—The inheritance of crooked- and straight-legged progeny in matings of 1 male with 8 females which had never shown signs of slipped tendons, and 1 male with 7 females all of which had shown a condition essentially characteristic of slipped tendon except that there was no disturbance in the chemical composition of the blood or the histology of the bones, was noted at the Kansas Experiment Station. In the straight-legged matings there were 18.63 ± 2.60 percent of progeny with crooked legs as compared with 50.00 ± 3.18 percent of crooked-legged progeny in matings of birds whose bones had previously exhibited this abnormality. The condition seemed to be hereditary. Significant differences between the expression of this abnormality in both sexes of the birds from straight-legged parents were noted. In matings of birds whose parents had shown the abnormality there were no significant sex differences in the offspring.

Further data on the inheritance of dwarfism in fowls, C. W. UPP (*Poultry Sci.*, 13 (1934), No. 3, pp. 157-165, fig. 1).—An analysis is reported of the inheritance of dwarfism in fowls which appeared at the Louisiana Experiment Station. The matings made to work out the inheritance of this characteristic

were somewhat involved with the appearance of the character "stickiness" in one pen, but the results indicated that they were separate and distinct characters. The ratios of normals and dwarfs produced by 33 dams and 10 sires were 464 normals and 123 dwarfs as compared with an expected number of 441 normals and 146 dwarfs if this character is due to a single autosomal recessive factor. Hens which did not carry the factor produced no dwarf young when mated with male carriers. The normal condition was not completely dominant as some heterozygous carriers of dwarfism could be recognized.

Retarded feathering in the fowl, D. C. WARREN (*Jour. Heredity*, 24 (1933), No. 11, pp. 431-434, figs. 2).—The inheritance of a character which caused the delayed appearance of secondary flight feathers in day-old chicks and retarded tail feathers and secondary wing feathers in young chicks is described in a contribution from the Kansas Experiment Station.

Back-cross matings of males showing a retarded feather development to heterozygous females produced 134 retarded and 110 normal offspring with 1 late-feathering (sex-linked) daughter. No sex differences were observed, and it was concluded that the character was due to a single autosomal recessive factor.

In other crosses involving late feathering the retarded feathering factor was found difficult to follow, but it was evident that the two factors were independent.

Firmness of albumen as an inherited characteristic, F. W. LORENZ, L. W. TAYLOR, and H. J. ALMQUIST (*Poultry Sci.*, 13 (1934), No. 1, pp. 14-17, fig. 1).—The California Experiment Station reports the results of a study of family differences in the firmness of the albumen of eggs laid by 2 lines designated as the high and low lines which originated from selections in which these characteristics showed significant differences. The average percentage of firm white in the high line was 66.7 ± 0.19 and for the low line 57.2 ± 0.22 . The high line was carried through 5 generations and the low line through 4, in which the mean percentage of firm whites showed significant differences with a tendency toward an increase in the percentage of firm white in the inbred members of the high line as compared with the random bred stock in this line.

These results suggest the existence of genetic factors which at least partially dominate the percentage of firm white in the eggs laid. The failure to lower the mean percentage of firm white by selection from a group, the apparent lack of consistent relationship between inbreeding and mean percentage of firm white in the low line, the actual segregation of relatively high families from the low line, and the greater variability in the low line suggest that factors for low percentage of firm white may be dominant to those for high percentage.

A rapid test for the diagnosis of pregnancy, C. W. BELLERBY (*Nature [London]*, 133 (1934), No. 3361, pp. 494, 495).—The use of the South African clawed toad (*Xenopus laevis*) in carrying out a rapid test for diagnosing early pregnancy is suggested. In such a test pregnancy urine is injected in the lymph sac, and ova are usually shed externally within from 6 to 9 hr. in positive tests.

A rapid test for pregnancy on *Xenopus laevis*, H. A. SHAPIRO and H. ZWAR-ENSTEIN (*Nature [London]*, 133 (1934), No. 3368, p. 762).—The advantages in using the South African toad as a test animal for diagnosing pregnancy are listed, as well as certain precautions which must be observed.

The experimental development of the mammary gland, C. W. TURNER and E. T. GOMEZ (*Missouri Sta. Res. Bul.* 206 (1934), pp. 44, figs. 24).—The ab-

stract of part 1 of this publication, previously noted (E. S. R., 71, p. 459) should be corrected to read as follows:

I. *The male and female albino mouse*.—Growth of the duct system of the mammary gland was stimulated by the administration of the estrogenic hormones. The growth of the lobules characteristic of the first 10 or 12 days of pregnancy was observed in the male mouse when 0.15 cc of corporin and 10 rat units of theelin were administered after a preliminary treatment with theelin. Castration appeared to have little influence on the type or rate of growth.

Experimental initiation of milk secretion in the albino rat, A. B. SCHULTZE and C. W. TURNER (*Jour. Dairy Sci.*, 16 (1933), No. 2, pp. 129-139).—The results of experiments conducted at the Missouri Experiment Station, dealing with the influence of subcutaneous injections of an oily extract of pregnant cows' urine, corpus luteum extract, an alkaline extract of sheep's pituitary, and fresh implants of pituitary glands in the initiation of milk secretion in albino rats, are reported.

The control glands were removed for determination of the development following the administration of different substances. Characteristic growth resulting in an extensive duct system with a few small lobules was produced by a small administration of theelin supplied in the pregnant cows' urine. The lobular system was stimulated by theelin and corporin, and secretory activity equivalent to that at the time of parturition was initiated by pituitary implants.

Fertility studies in poultry, C. NICOLAIDES (*Poultry Sci.*, 13 (1934), No. 3, pp. 178-183).—A study is reported from the Massachusetts Experiment Station of the time required for fertilization to take place and the duration of fertility from matings in a Rhode Island Red flock. The time elapsing between mating to laying of the first fertile egg varied from 19½ to 238 hr. in single controlled matings, with a mean of 66.24 hr. Hens laid fertile eggs for an average of 14.83 days following a mating. From 1 to 14 fertile eggs were laid from a single mating. There were no significant differences in fertility resulting from stud mating and pen mating.

Relation of time of laying to hatchability, E. M. FUNK (*Poultry Sci.*, 13 (1934), No. 3, pp. 184-187).—A comparison is reported of the hatching results of 16,839 eggs produced at the Missouri Experiment Station before 9 a. m., from 9 to 12, from 12 to 2 p. m., and after 2 p. m. A significantly higher hatchability was observed in the eggs laid in the afternoon than for those laid in the morning, although the differences were small. Hatching results were decreased by the use of all-night lights in 1933, but no such decrease was noted in 1932. Data are also reported on the influence of holding eggs for 6 hr. at 101° F. immediately after collection. This was found to have no significant influence on hatchability.

Morphological study of differentiation of sex of chicks, A. L. ROMANOFF (*Poultry Sci.*, 12 (1933), No. 5, pp. 305-309, figs. 3).—Measurements were made at the [New York] Cornell Experiment Station of the heads and beaks and the weights and dimensions of some of the internal organs of over 200 day-old chicks. These data showed that although minor differences were found they were relatively small. In general, body weight, size of head and beak, unabsorbed yolk, and internal organs were larger in the male than in the female, the exception to this being the length of the cecum and the weight of the liver. However, it was also noted that the size of the chick of either sex was positively correlated with the size of head, length of cecum, and weight of the liver.

FIELD CROPS

[Field crops investigations at the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed., pp. 21-33, 36-45, 58, 59, 60-62, 63, 64, 104-108, 115-118, 122, 124*).—Research with field crops again (*E. S. R.*, 69, p. 790) reported on from the station and the Isabela Substation comprised variety, spacing, cultivation (of ratoons), irrigation, fertilizer, and green manuring tests, breeding work, and studies of selection methods, all with sugarcane; fertilizer, spacing, and irrigation trials and breeding work with cotton; fertilizer and irrigation tests with tobacco; a fertilizer test with potatoes; variety trials with yautias, yams, cassava, peanuts, and corn; and tests of chayotes, arrow root, seguidilla, yam beans, and *Derris* spp.

Grassland and forage crops in Thuringia, Czechoslovakia, and Hungary, R. O. WHYTE, E. KLAPP, F. CHMELAŘ, R. FLEISCHMANN, G. LENGYEL, and G. M. ROSEVEARE (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 15 (1934), pp. 57, figs. 9*).—Environmental factors involved in forage production, producing districts, the distribution of individual crops, and research in progress, are discussed for Czechoslovakia, Hungary, and the State of Thuringia (Germany). Bibliographies of published research are included.

Winter legumes (*Mississippi Sta. Bul. 303 (1934), pp. 37, figs. 4*).—Information compiled from reports of experiments and studies with winter legumes by State experiment stations and the U. S. Department of Agriculture covers production costs, increased yields of succeeding crops, residual effects, insect pests, diseases and other causes of failure, value for grazing and hay, choice of legumes, and the practices of inoculation, planting, grazing, saving seed, harvesting for hay, and time of turning under winter legumes.

Barley varieties compared under different seed treatments at Chatham Station, B. R. CHURCHILL (*Michigan Sta. Quart. Bul., 17 (1934), No. 1, pp. 41-44*).—Wisconsin 38 barley, leading other varieties in yield whether treated for disease control or not, seemed very satisfactory for pure seedings, while Spartan is advised where alfalfa, clover, or grass is sown with barley. The yields of these and four other barleys under different seed treatments, their tillering, and days to heading are indicated, with remarks on incidence and control of stripe and covered smut.

The morphology and biology of *Apocynum sibiricum* [trans. title], S. S. BERGLAND and P. I. BORISOV (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.), 1 (1931), pp. 67-137, figs. 39*).—The chief morphological characters of *Apocynum*, its geographic distribution, classification of species and varieties, biology of the plants in relation to growth and origin, and biological peculiarities of natural varieties, are reported on from 4 years' investigation at the Turkistan Station for Selection and Breeding. A key for the various forms is appended.

A biological study of the flowering and fruiting of *Apocynum sibiricum* [trans. title], P. I. BORISOV (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.), 1 (1931), pp. 152-193, figs. 7*).—A study of the development of buds, flowers, and fruit, and morphology and regularity of flowering in *Apocynum* is reported, with remarks on the progress of breeding work with the crop.

Propagating *Apocynum sibiricum* by seeds [trans. title], A. STAROSELSKII (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.), 1 (1931), pp. 138-151, figs. 6*).—Planting experiments under irrigation in Turkistan showed that this crop may be drilled, care being taken not to plant the seeds deeper than 1 cm.

Growing better kidney beans, H. R. PETTIGROVE (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 1, pp. 28-33, figs. 4).—Suitable production practices are outlined, with remarks on reduction of loss from bacterial blight and elimination of the off-type known as faders. The fader, a vine type which fades in soaking before cooking or canning from rich red to pinkish gray and differs somewhat from the normal red kidney in luster and shape, may be excluded by hand-picking the planting seed, roguing vined and off-color-blossom plants in the field, and maintaining a rogued seed plat.

Bluestem pastures, A. E. ALDOUS (*Kans. State Bd. Agr. Bien. Rpt.*, 28 (1931-32), pp. 184-191, figs. 2).—The extent and characteristics of bluestem pastures are described, with accounts of research at the Kansas Experiment Station on their response in quality of grass to grazing, the effects of deferred grazing and burning, and the control of brush and weeds, already noted from other sources (E. S. R., 60, p. 358; 61, p. 125; 64, p. 826; 67, p. 124; 69, p. 199).

The influence of storage conditions on hardness in clover seeds, H. STÜTZ (*Über den Einfluss verschiedenartiger Lagerung auf die Hartschaligkeit von Kleesamen. Diss., Hamburg Univ.*, 1933, pp. [5]+43).—Storage studies with seed of alfalfa and red, white, and alsike clovers, continuing research of Esdorn (E. S. R., 68, p. 461), showed that as with lupines, the degree of hardness depends on the temperature and air humidity of storage. Less hardness (at least in the first 8 mo. after harvest) resulted from storage at lower temperatures in very moist air than at about 18° C. (64.4° F.) and in drier air. Hardness in seed of these legumes did not vary with fluctuations in relative humidity as in yellow lupine seed. Clover seed reacted significantly less to climatic conditions, alfalfa showed the greatest response, and white and alsike clover were relatively stable. Seed appeared to be especially sensitive for several months after harvest and just after dehulling. Thereafter, particularly from spring on, hardness gradually decreases in both cool and warm storage. For general practice, cool storage in rather moist air is suggested for the first half year after harvest, keeping in mind that prolonged storage under too moist conditions may greatly impair germination.

A comparison of reciprocal top crosses in corn, R. R. ST. JOHN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 721-724).—Behavior of crosses of Krug corn \times inbreds and their reciprocals in cooperative studies by the Indiana Experiment Station and the U. S. Department of Agriculture suggested that the yield of a cross of a commercial variety on an inbred cannot be taken as an accurate criterion of the productivity of its reciprocal. Crosses on the variety as seed parent not only tended to yield more as an average, but the tendency was variable, with many of the reciprocals yielding equally within limits of error.

A comparison of the surface, furrow, and listed methods of planting corn, M. T. JENKINS (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 734-737).—Comparisons by the Iowa Experiment Station cooperating with the U. S. Department of Agriculture showed level-planted corn to average 67.6 bu. per acre, furrow planting 65.7, and listed corn (effective in reducing European corn borer infestation) 70 bu. The furrow and listed plantings had slightly lower ears, and more plants erect at harvest, and somewhat larger ears than the level planting, while the listed corn was later in tasseling and silking and had more moisture at harvest than the other plantings. Extra care was required to obtain comparable stands in the listed plantings.

Size, shape, and replication of plats for field experiments with cotton, E. B. REYNOLDS, D. T. KILLOUGH, and J. T. VANTINE (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 725-734, figs. 2).—Statistical studies by analysis of variance

were made on cotton yield (pounds of lint per acre) data from a blank experiment collected in 1931 at the Texas Experiment Station from 48 36-in. rows, 300 ft. long, harvested in 48-ft. sections, comprising 288 plats (rows) each 0.0033 acre, and from a similar test in 1932 at Chillicothe on 48 40-in. rows, 282 ft. long, harvested in 47-ft. sections, comprising 288 plats each 0.0036 acre. The results indicated that the investigator has a considerable range in selecting size and replication of plats, depending on land available. Where land is not limited, plats 100 to 150 ft. long replicated six or seven times would be satisfactory, but where only a small area is available, smaller plats, 50 to 100 ft. long, with more replications to provide the same accuracy would result in more efficient land use. Shape of plat had no significant effect on variability at the station, but long, narrow plats were less variable than short, wide plats of the same size at Chillicothe. In general, long, narrow plats are preferable.

Growing cotton under irrigation in the Wichita Valley of Texas, C. H. McDOWELL (*Texas Sta. Bul. 494 (1934), pp. 21, figs. 2*).—Variety, fertilizer, spacing, delinting, and irrigation experiments made with cotton at Iowa Park during the period 1927–33 are reported, with recommended production practices and comments on climatic conditions and the incidence and control of cotton insects, cotton root rot, and angular leaf spot.

Varieties outstanding in yield and quality of staple included Delfos, D. & P. L. No. 10, Qualla, Ferguson 406, Missdel, and Acala. Fertilizers increased yields about 11 percent on the average, but the increases usually were unprofitable. Manure returned the largest gains and its moderate use is advised because it also improves the physical condition of the soil. Cotton evidently should not be planted before April 22 or after June 15. Spacing the plants from 6 to 24 in. in the row gave best results, with 6-in. spacing slightly leading 12-, 18-, and 24-in. distances. During 1932–33 maximum cotton yields required an average of from 28 to 30 in. of water, including about 14 in. of rainfall during the growing season and the remainder supplied by irrigation. Heavy irrigations with from 2 to 3 acre-in. of water at longer intervals gave better results than frequent light applications.

The Ishan cotton plant under mixed cultivation, III, E. H. G. SMITH (*Nigeria Agr. Dept. Ann. Bul., 10 (1931), pp. 52–60, figs. 2*).—Interplanting Ishan cotton with early (March 30 planted) corn, as with yams in previous studies (E. S. R., 66, p. 823), retarded stalk height at one time by about 30 percent, but recovery was early and rapid and production of flowers and bolls, shedding, or yield were not affected and corn yields were very satisfactory. With late (August planted) corn, the growth of the main stem of cotton was not altered, but flower and boll production and yields fell from 25 to 30 percent and boll shedding was affected slightly. Only 49 percent of the late corn-stalks produced ears.

Variations in the characters of cotton fibres with the progress of the season, K. R. SEN (*Indian Jour. Agr. Sci., 4 (1934), No. 2, pp. 295–319, figs. 3*).—Examination of fiber characters of well-opened bolls of the Punjab-American cottons Early Strain, 4F, and 289F (E. S. R., 69, p. 41), collected at 2-week intervals in the fall months of 1930 and 1931, revealed a progressive deterioration of certain fiber characters, e. g., maturity and weight, with progressive lowering of soil and air temperatures. A significant correlation was noted between fiber maturity and fiber weight per centimeter during the different pickings, but none between average fiber length and seed index or percentage of lint. In the Early Strain torsional rigidity was highly correlated with fiber maturity of fiber weight per centimeter, and with advance of the season came a slight tendency of fiber strength to deteriorate progressively, torsional rigidity diminished, and the percentage of immature fibers increased.

A note on the differentiation of hairs from the epidermis of cotton seeds, A. N. GULATI (*Indian Jour. Agr. Sci.*, 4 (1934), No. 3, pp. 471-475, pls. 3).—Cytological evidence in favor of continuous differentiation of hairs on growing cotton seeds is presented. Photomicrographs reveal mitotic division of epidermal cells in longitudinal sections at different stages up to the tenth day after flowering and new hair cells near old ones in seeds of the same age.

Motes in cotton.—I, Punjab-American cotton, M. AFZAL and T. TROUGHT (*Indian Jour. Agr. Sci.*, 4 (1934), No. 3, pp. 554-573, figs. 2).—Motes were found to vary from 4.28 to 25.02 percent in individual cotton plants, and within plants they varied greatly from boll to boll and lock to lock. The percentage of mote-free bolls decreased as the number of locks per boll increased. Motes were located in a definite pattern in the lock, being fewest in central or top positions. It appeared that mote production might be attributed to nutritional defects of individual bolls, and that defective pollination is a minor factor. With the 4F strain, motes decreased as planting was delayed.

The effect of irrigation on the development and yield of hemp [trans. title], I. E. RABINOVICH and A. E. SAMOILOV (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.)*, 1 (1931), pp. 214-232, figs. 2).—More frequent irrigation up to flowering was found to increase bud formation, but not to speed up flowering or ripening. Frequent irrigation resulted in increased diameter of stems, but after blooming had no effect on stem development, and the same held true as to quantity of fiber. Four to five irrigations before flowering made it unnecessary to irrigate thereafter, although seed production was lower.

Experiments on drying hemp seed [trans. title], M. S. DUNIN and L. S. GITMAN (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.)*, 1 (1931), pp. 243-253).—Hemp seed could be dried successfully at 80° C. for a maximum of 30 min. or at 50° for 4.5 hr. Beginning the drying at a lower temperature and completing it at a higher one impeded germination.

Native lespedezas in Kansas, J. R. BENTLEY (*Kans. Acad. Sci. Trans.*, 36 (1933), pp. 78-81, fig. 1).—The distribution and features of seven native species of lespedeza in Kansas are described, with remarks on threshing their seed and increasing its germination by scarification or by sulfuric acid treatment.

The poppy, its classification and its importance as an oleiferous crop [trans. title], M. A. VESELOVSKAĬA (M. VESSELOVSKAYA) (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant-Breeding)*, 1933, Sup. 56, pp. [3]+213+XXII+[2], pls. 3, figs. 58; Eng. abs., pp. I-XXII).—Successive chapters in this work deal with the history and distribution of poppy culture; heritable characters and their variation, based on extensive study of cultures of material from many sources; the differentiation of forms into definite ecological or geographical groups; a classification with determinative keys and descriptions of the groups, subgroups, and varieties of *Papaver somniferum*; relation of dehiscent poppies and *P. setigerum* (44 chromosomes) to *P. somniferum* (22); the regional distribution of the poppy as an oil plant in the U. S. S. R., with data on the influence of variety, cultivation, and environmental conditions on yield and oil content of seed; and the results of a study of blooming, pollination, and seed setting, with remarks on possibilities of breeding for oil content. An extensive bibliography and bilingual tables and legends are included.

Growing potatoes in Colorado, C. H. METZGER (*Colorado Sta. Bul.* 412 (1934), pp. 102, figs. 68).—Outlining the best-known methods of potato production, this bulletin describes the status of the industry in Colorado, producing districts, and the climatic, soil, rotation, and fertility requirements of the crop;

indicates suitable varieties and their characteristics; discusses the certification, selection, treatment, and preparation of seed; details cultural and field practices, including irrigation and harvesting and storage methods; tells of important plant diseases and insects attacking potatoes and their control; and remarks briefly on the marketing of the crop.

Anthesis and pollination in ragi, *Eleusine coracana* (Gaertn.), the finger millet, G. N. R. AYYANGAR and U. A. WARIAR (*Indian Jour. Agr. Sci.*, 4 (1934), No. 2, pp. 386-393, pl. 1).—In studies at Coimbatore ragi flowers were observed to open from 1 to 4 a. m., spikes with open fingers opening earlier than those with curved fingers. A spike required from 7 to 8 days to complete flowering. The very short period of anthesis is conducive to self-pollination, although natural hybrids are possible.

Milling and baking properties of the varieties of rye [trans. title], SH. KAZARIAN (S. KAZARYAN) (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant-Breeding)*, 1933, Sup. 55, pp. 134+[1], figs. [14]; *Eng. abs.*, pp. 121-134).—Milling and baking tests on 171 samples of winter rye, including 13 sorts of Russian origin and 7 foreign varieties grown in different parts of Russia, are reported in detail. Although the technical qualities of rye varieties appeared relatively constant compared with those of wheat, they may vary considerably with soil and climatic conditions and variety. Foreign ryes were inferior in yield, but better in technical properties than the improved Russian varieties. Vyatka, a Russian rye, proved to be the most generally satisfactory. Correlations observed included flour yield and weight per 1,000 kernels $r=0.32\pm0.07$, volume of loaf and weight per 1,000 kernels 0.41 ± 0.06 , volume of loaf and flour yield 0.22 ± 0.07 , weight per 1,000 kernels and weight per bushel 0.2 ± 0.06 , volume of loaf and grain yield -0.22 ± 0.07 , and weight per 1,000 kernels and grain yield -0.26 ± 0.07 .

Sorghums for forage and grain in South Dakota, A. N. HUME and C. FRANZKE (*South Dakota Sta. Bul.* 285 (1934), pp. 62, figs. 14).—Varieties, cultural methods, and field practices for growing sorgo, grain sorghum, and Sudan grass variously for forage, silage, or seed are recommended from prolonged experiments at the station and four experiment farms, supplementing earlier work (*E. S. R.*, 38, p. 341). Discussion is given on the status of the crop, its place in the cropping system, characteristics of the plant, varieties and their classification, and danger from prussic acid poisoning, and data on annual rainfall at the several stations are appended.

Sorghum is considered better for forage than for grain in South Dakota, since grain yields of corn usually equaled or exceeded those from sorghum and the reverse was true in forage production. Varietal comparisons suggested some variety or strain of Amber sorgo or a closely related sorgo for high yields of forage. Sudan grass yields less forage than Amber sorgo, but produces good hay. The area represented by the Cottonwood Experiment Farm, west of the Missouri River, is most favorable for sorghum growing, while in other sections sorghum should supplement rather than replace corn, especially in the case of prospective drought or grasshoppers. While sorghum may be sown in single or double cultivated drills, drilled close, or broadcasted, higher forage yields were secured at Eureka and Cottonwood from Sudan grass or other sorghums grown in cultivated drills. Seeding rates range from 4 to 12 lb. per acre in cultivated rows up to 50 lb. in solid drills or broadcasted, and the optimum planting date (for Sudan grass) was about June 1 in tests at Brookings and Highmore.

Field experiments with sugar cane, I-III, C. H. B. WILLIAMS, R. R. FOLLETT-SMITH, and C. CAMERON (*Brit. Guiana Dept. Agr., Sugar Bul.* 1 (1933),

pp. [5]+IV+102, figs. 36; 2 (1933), pp. [7]+50, figs. 13; 3 (1934), pp. [8]+144, figs. 48).—Variety, fertilizer, and drainage trials, carried on in British Guiana during the 3 yr. ended June 30, 1934, showed the superiority of the Diamond 10 and P. O. J. 2878 canes and the merits of several other promising varieties; the response in yield and sugar production of plant and ratoon canes on flooded and unflooded frontland soil and pegasse soils to nitrogen, lime, and potassium; and the advantages of improved drainage. Practical applications of the results are discussed.

Sugarcane variety P. O. J. 2878 in Puerto Rico, R. L. DAVIS (*Puerto Rico Sta. Bul.* 35 (1934), pp. 45, figs. 7).—The behavior of P. O. J. 2878 sugarcane in different localities in Puerto Rico is described from extensive varietal comparisons and general field plantings made under various soil and climatic conditions with the cooperation of the Insular Experiment Station and a number of centrals.

P. O. J. 2878 surpassed B. H. 10(12) in sugar production in primavera (spring plantings) and ratoons near Cambalache and San Vicente, and was outstanding in the San German Valley, especially on clay soils. It equaled B. H. 10(12) on heavy soils in gran cultura (summer or fall planting) at Central Coloso. P. O. J. 2878 was inferior in gran cultura to B. H. 10(12) on lowland at Fajardo and in the eastern end of the island and on lowland subject to overflow along the north coast and in the Anasco Valley (where it surpassed S. C. 12/4 and P. O. J. 2725 in gran cultura on upland), and on flooded friable alluvial soils in the San German Valley. At Isabela in general field trials, P. O. J. 2878 was superior to S. C. 12/4 in cane production, but generally lower in sugar yield. Neither is satisfactory for the district but both give better results than B. H. 10(12).

The advantages of P. O. J. 2878 include prolific stooling habit, rapid growth, high cane production, resistance to drought and mosaic, ease of harvest due to erect growth and free shedding of leaves, ability to recover after being flooded, and ratooning power. Objections to P. O. J. 2878 are a tendency to uproot, reduction in cane girth in ratoons, hairy leaf sheaths, profuse arrowing, and retarded defecation due to low percentage purity.

Studies on handling sugarcane frozen early in March in advanced stages of development, G. ARCENEUX and R. B. BISLAND (*U. S. Dept. Agr. Circ.* 324 (1934), pp. 8).—Experimental studies in 1932 in Louisiana on methods of handling sugarcane frozen early in March, when in advanced stages of development, demonstrated that where the cane had reached a stage of growth permitting the development of aerial shoots from surviving buds on the stalk, removal of the frozen growth was beneficial. With cane in lesser stages of development, removal of frozen growth by cutting or shaving generally was not beneficial and often resulted in lower yields of cane and sugar per acre.

The influence of soil treatment upon the composition of sweet clover, H. J. SNIDER and M. A. HEIN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 740-745).—The composition of sweetclover (*Melilotus alba*), grown on Cisne silt loam on the Illinois Experiment Station's DuBois soil experiment field, was studied at different stages of development. Sweetclover on soil treated with the combination of residues, lime, phosphorus, and potassium contained throughout the season greater weights per acre of dry matter, nitrogen, and potassium, and usually surpassed that on other treatments in total phosphorus. Its total nitrogen varied from 106 lb. an acre with lime alone to 163 lb. on the above combination. Phosphorus rose from about 6.5 lb. per acre on unphosphated plats to a maximum of about 20 lb. on phosphated plats. Use of potash salts increased the maximum amount of potassium per acre to 102 lb. v. about

30 lb. in the sweetclover without potash treatment. The root to top ratio indicated that sweetclover concentrates dry matter, nitrogen, phosphorus, and potassium in the roots during fall and rapidly translocates them to the tops as growth progresses in early spring. The maximum amounts were found from June 25 to July 21 in the second year's growth.

A record of wheat breeding, 1921-1932, G. P. MORRIS, M. EL DIB, and A. MUNIB (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 127 (1933), pp. [5]+127, pls. 9).—Wheat breeding activities in Egypt reviewed for the period 1921-32 included trials of Egyptian and imported wheat varieties, their purification and improvement by pure line selection, production of new sorts by hybridization, observation of incidence and degree of attack of rusts and other diseases, yield, milling and baking tests, chemical analysis, and bulk propagation of promising strains. Statistics on producing areas, yields, production, commercial movement, and consumption of wheat in Egypt and flour prices are appended.

The relation between awns and yield in spring wheat, O. S. AAMODT and J. H. TORRIE (*Canad. Jour. Res.*, 11 (1934), No. 2, pp. 207-212).—Studies with a number of F_2 lines of Reward \times Caesium, and also with awned and awnleted strains of Marquillo \times Marquis-Kanred, at the University of Alberta, did not reveal significant relationships between awns and grain yield. Apparently contradictory results obtained by different investigators suggest that the relation between these characters differs, depending both upon the material used and the environmental conditions under which it is grown.

Effect of various smut treatments on yield of winter wheat, A. F. BRACKEN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 748-751).—Untreated seed in comparisons at the Nephi (Utah) Dry-Farm Substation gave a 10-year average acre yield of 24.7 bu., copper carbonate-treated 24.8, copper sulfate 23.4, and formalin-treated wheat 21.8 bu. Fall planting in dry soil in most cases was associated with a lowering of the yield for the wet treatments. However, in two of the four seasons when no difference of yield was shown as to treatment, the wheat failed to emerge until winter or early spring.

Studies on test weight and flour yielding capacity of wheats, C. E. MANGELS (*Cereal Chem.*, 11 (1934), No. 2, pp. 231-235).—Data for wheat varieties grown at the North Dakota Experiment Station and Dickinson, 1928-30, showed Ceres, Power, Hope, Marquillo, Quality, Garnet, and Kota to surpass the actual flour yield (73.9 percent) and flour yield-test weight ratio (1.23) of Marquis, whereas Reward, Preston, Progress, and Hurdsfield were lower in these respects. As indicated by data for Ceres from 1925 to 1932 at the station, post-harvest conditions rather than seasonal variation during the growing period are the important factor. Regional variation did not appear to be highly important in affecting flour-yielding capacity.

The connection between the physical and chemical characters of wheat grain and the yield of flour [trans. title], M. I. KNYAGINICHEV (KNYAGINICHEV) (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant-Breeding)*, 27 (1931), No. 2, pp. 90-128, figs. 7; *Eng. abs.*, pp. 122-128).—Examination of numerous samples of different types of wheat suggested that weight per bushel rather than specific gravity characterizes the milling quality of a variety. Particular attention was paid to X , the ratio between thickness of kernel and depth of crease, which varies with locality, and fluctuates quantitatively most in durum, less in hard spring wheat, and least in soft spring wheat. Correlations between X and flour yield were 0.96 ± 0.014 in durum, 0.78 ± 0.083 in soft winter wheat, and 0.67 ± 0.089 in soft spring wheat. Y , the ratio between thickness and width of kernel, varied slightly within limits of a variety,

being most stable in durumms. The ash content of wheat grain grown on the same field was correlated with absolute weight only when the absolute weight of the varieties varied from 8-12 g to 20-22 g and above, but not when the absolute weight fluctuated from 20-22 g and above. Ash content of grain, within limits of one variety, was influenced little by absolute weight.

Baking properties of wheats in mixtures [trans. title], SH. KAZARYAN (S. KAZARYAN) (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant-Breeding)*, 27 (1931), No. 2, pp. 3-87; *Eng. abs.*, pp. 83-87).—A detailed report of the baking quality of flours milled from various mixtures of varieties and of different classes of wheat from different localities in Russia in comparison with flours from unmixed varieties is presented, with comments on the merits of the several mixtures.

Crested wheatgrass, H. L. WESTOVER (*U. S. Dept. Agr. Leaflet 104* (1934), pp. 8, figs. 6).—Practical information is given on the characteristics and adaptation of crested wheatgrass (*Agropyron cristatum*) (E. S. R., 67, p. 518), seedling practices, its use for pasture and turf, and on harvesting the seed crop.

Crested wheat grass, L. E. KIRK, T. M. STEVENSON, and S. E. CLARKE (*Canada Dept. Agr. Pam. 157, n. ser.* (1934), pp. 22, figs. 9).—Information presented on the characteristics of crested wheatgrass, its adaptation in Western Canada, its yields, palatability, and composition compared with other grasses especially slender wheatgrass and brome grass, cultural, harvesting, and seed production practices, varieties or strains, and its use for lawns, particularly the Fairway strain, is based extensively on research at the University of Saskatchewan and the Dominion Range Experiment Station, Manyberries, Alberta.

Research seed projects, J. W. ZAHNLEY (*Kans. State Bd. Agr. Bien. Rpt.*, 28 (1931-32), pp. 191-194).—From germination tests on numerous lots of sorghum seed, loss of viability on the approach of the planting season seemed due to unfavorable storage conditions rather than natural shortness of life. Very little loss in viability occurs during spring months when seed is stored in small quantities with low moisture content and kept dry. Longevity tests showed yellow milo and feterita to lose vitality somewhat faster than sorgo, Sudan grass, kafir, or German millet. The hard seed percentage in alfalfa, sweetclover, and Korean lespedeza decreased gradually and fairly rapidly in protected outdoor storage begun 3 mo. after harvest and continued 18 mo., whereas in a heated room the decrease was slower in alfalfa, practically nil in sweetclover, and the rate did not differ appreciably from outdoor storage with lespedeza seed.

Physiological investigations on water-hyacinth (*Eichhornia crassipes*) **in Orissa**, with notes on some other aquatic weeds, P. PARIJA (*Indian Jour. Agr. Sci.*, 4 (1934), No. 3, pp. 399-429, pls. 6, figs. 8).—The several experiments reported dealt with the dormancy and germination of seeds of water-hyacinth, floating of seedlings, effect of H-ion concentration on growth, drought resistance, and the effects of poison on this weed and on *Pistia stratiotes*, and water fern (*Salvinia cucullata*).

Water-hyacinth was observed to set seed only in autumn, i. e., in October and November. The seeds remain dormant, due to the hard seed coat, for at least one season, November until June, and retain viability for several years. Any deviation from the optimum, pH 6 to 8, appeared to check growth. The plant could survive drought even with soil moisture as low as 5.7 percent. The lethal dose of copper sulfate, the most effective chemical, was 0.018 percent, yet even strong solutions did not kill all plants, possibly because calcium salts liberated by the decaying hyacinths rendered the copper sulfate ineffective to some degree.

Consequently herbicides must be supplemented by mechanical clearing. *P. stratiotes* and *S. cucullata* could be cleared by spraying with kerosene or a mixtures of kerosene and copper sulfate (0.006 percent). The author points out that the lethal concentration of copper sulfate also kills fish.

HORTICULTURE

The first plant patents: A discussion of the new law and Patent Office practice, R. S. ALLYN (*Brooklyn, N. Y.: Ed. Found. Inc., 1934, pp. 109, figs. 85*).—Herein are presented abstracts of 84 patents and a history of the enactment of the authorizing legislation.

[Horticulture at the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed., pp. 45-55, 56, 62, 63, 109, 120, 121, 122, 123, 124, 125*).—Herein are presented briefly the results of varietal, fertilizer, and propagation trials with coffee; varietal trials with avocados, mangoes, grapes, and various tropical fruits; fertilizer and other studies with the coconut; variety studies with the banana, plantain, bixa, and yam; shipping and other investigations with sweet corn; fertilizer trials with pimiento peppers, tomatoes, eggplants, lima beans, cucumbers, and squashes; and miscellaneous studies with oranges, lemons, and pineapples.

Propagation of plants by cuttings in Hawaii, W. T. POPE (*Hawaii Sta. Circ. 9 (1934), pp. 35, figs. 4*).—This is a general treatise covering the principles underlying the taking and growing of cuttings, supplemented with specific information regarding fruits, vegetables, grasses, and other plants grown in Hawaii.

Temperature as a factor affecting flowering of plants, H. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 440-446*).—A summary is presented of the results of extensive investigations at Cornell University upon the effects of ecological factors, particularly temperature, upon the flowering of various vegetable crops. For the most part the studies have been previously reported. Investigations with lettuce indicated that high temperature (70° to 80° F.) prevents head formation and materially hastens seeding. Increasing the length of day increased the size of lettuce heads growing in a cool greenhouse.

The effect of soil conditions on the growth and composition of certain vegetable crop plants as influenced by soil reaction, M. M. PARKER, J. B. HESTER, and R. L. CAROLUS (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 452-457, fig. 1*).—Observations at the Virginia Truck Experiment Station on the growth and yield of plants in soils of pH 4.4, 5, 5.5, 5.9, 6.2, 6.4, and 7 showed marked yield reductions in all the species under test when the soil was below 5.5. Black-eyed peas and radishes were the least injured at pH 4.4. The optimum soil reaction for the five crops ranged from a minimum of 5.9 for black-eyed peas to 7 for small-seeded lima beans and radishes. Analyses of dried foliage of cabbage, garden peas, and large-seeded lima beans showed a tendency for N to accumulate in plants at the lower pH values. P was lowest in the plants growing under the most acid conditions, both in percentage of dry weight and actual amount. P increased to a maximum between pH 5.9 and 6.4 and then declined toward neutrality. Ca followed to some extent the amounts applied, but Mg was absorbed to a greater extent at the lower reactions and was replaced by Ca as neutrality was approached. K was also replaced by Ca at the higher reactions. A gradual decrease in Fe on a percentage basis was observed in garden peas as the soil became less acid. It is suggested that the large amount of soluble Al in the soil below pH 5 contributed to the poor growth.

The influence of soil type on results from paper-mulch trials with the pepper and eggplant, K. C. WESTOVER and E. N. McCUBBIN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), p. 465).—On a clay soil at Morgantown, W. Va., paper mulch significantly increased the yields of peppers and eggplants, whereas on a fine sandy loam at Lakin the differences were slight, except for some increase in early production. Soil temperature and soil moisture are conceded to be the influencing factors.

The effect of certain truck crops on the yield of truck crops following them on the same plots in the next season, W. B. MACK, G. J. STOUT, and F. W. HALLER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 447-451, fig. 1).—At the Pennsylvania Experiment Station early cabbage, onions, sweet corn, stringless beans, potatoes, tomatoes, summer pumpkins, carrots, and late cabbage were grown so that each crop followed itself and each of the other crops in each year after the first. In the interim between crops rye and winter vetch were grown. In 1930 the yields of crops following early cabbage, onions, summer pumpkins, and carrots were significantly larger than those of the same crops following sweet corn, potatoes, and tomatoes. However, since the response of the crops was not the same year after year, the authors suggest that differences may have resulted from conditions other than the direct effect of the preceding crop on the soil, perhaps to the condition of the soil at the time certain cultural operations were performed.

The use of evaporation records in irrigation experiments with truck crops, E. MORTENSEN and L. R. HAWTHORN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 466-469).—Micrometer readings at the Winter Haven branch of the Texas Experiment Station on the accumulated evaporation from a still well in a circular tank 10 ft. in diameter were found useful indexes to the irrigation requirements of onions, spinach, and strawberries. Too frequent irrigations, based on simple observations, were found to decrease yields of onions and spinach, but with Missionary strawberries the greatest yields were secured with the more frequent irrigations.

The influence of planting distances on the yield of snap and lima beans, W. A. MATTHEWS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 567-570).—Using as plant material Refugee, Burpee Stringless Greenpod, and Henderson Bush lima beans, the author found in these studies at the University of Maryland that larger total and early yields were secured from all three varieties from 3-in. than wider spacings. There was a consistent increase in the number of fruits per plant as the spacing was increased, but this was not sufficient to offset the advantage of the greater number of plants at 3 in.

External and internal factors affecting blossom drop and set of pods in lima beans, H. B. CORDNER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 571-576, figs. 3).—Studies at the University of Maryland upon the flowering habit of the individual racemes of Henderson Bush lima beans indicated that the abscission of buds occurs almost as frequently as that of flowers, and that relatively little dropping occurs after petal fall. With an average of almost 53 potential buds and only slightly over 2 pods setting per raceme, it was apparent that a marked excess of reproductive structures are provided. Flowering began at the base of the peduncle and progressed toward the terminal. Climatic conditions of high air temperature and low relative humidity apparently favored abscission of blossoms, but in the Henderson Bush lima bean the early-blooming racemes were more productive than later racemes irrespective of the climate. Observations indicated that the racemes of different varieties varied with respect to fruiting capacity on the basis of the number of fruits set.

The effect of soil type, soil acidity, and organic matter on the growth of beets, the solubility of aluminum, and the availability of plant nutrients, J. B. HESTER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 460-464).—With the same fertilizer treatment applied throughout, wide differences were recorded in the response of beets growing in the greenhouses of the Virginia Truck Experiment Station in three soil types, (1) Portsmouth loamy fine sand, (2) Bladen sandy loam, and (3) Norfolk very fine sand. Soil reaction differences brought about by differential lime applications and inherent differences in organic matter are believed to be the factors influencing the availability of nutrients. Aluminum toxicity and the effect of free aluminum ions in tying up the available phosphorus were said to be the causes of low yields in all three soils at the lower pH values. Applications of organic matter were effective even at the low pH values in increasing the availability of phosphorus.

Color of the central parenchyma of the leaf petioles as an index of the internal root color in table beets, O. B. COMBS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 458, 459).—Observations at the University of Wisconsin indicated that there exists a direct relationship between internal root color and the amount or intensity of color in the central parenchyma of the leaf petioles. Of a total of 1,901 beets sectioned, 75.4 percent were found to exhibit root and petiole colors of the same order.

Response of early cabbage to manures and fertilizers, T. E. ODLAND and F. K. CRANDALL (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 470-474).—That fertilizer and green manures may be used advantageously to replace animal manures in vegetable culture was indicated in these studies at the Rhode Island Experiment Station. Sixteen tons of manure supplemented by chemicals produced larger and more economical yields of early cabbage than did 32 tons alone. An application of 8 tons of manure per acre in the green manure rotation increased yields about 10 percent above those obtained with green manure and chemicals only. N was relatively more effective than K or P in increasing the yields of early cabbage. Attempts to substitute limed native peat for manure were not successful.

The premature seeding of celery.—A second report, C. C. STARRING (*Montana Sta. Bul.* 292 (1934), pp. 14, fig. 1).—Following an earlier bulletin (E. S. R., 52, p. 640) in which it was pointed out that low temperature during the early life of the celery plant is a potent factor in its flowering behavior, the author reports success in isolating strains of celery resistant to seeding when transplanted under low temperatures. One selected strain of Giant Pascal and four of Golden Plume did not develop seed stalks when adjacent commercial stocks under identical treatment seeded as high as 85 percent. Premature seeding appeared due to physiological changes within the plants resulting from long exposure to temperatures below 60° F. Warm house plants set out about the time of the last expected spring frost developed no seeders as compared with from 2 to 11 percent in plants set out from 2 to 3 weeks earlier. No change in soil or in amount of water applied influenced seeding. Trimming transplants increased the amount of seeding at low temperatures but had no effect at high temperatures.

Chemical treatments for shortening the rest period in tubers of Jerusalem artichoke, C. E. STEINBAUER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 475-479).—At Arlington Experiment Farm, Va., tubers of four varieties of Jerusalem-artichoke dug before freezing and treated with various chemicals to abbreviate the rest period were brought into growth from 15 to 150 days sooner than the untreated controls. However, subsequent growth was in all cases much slower than where the rest was broken by low temperature. At

Arlington the rest period of Jerusalem-artichokes begins about September 1 and continues from 160 to 180 days. Some indication of varietal difference in response was noted.

The relation of bulb size to the thickness of the outer scales in the onion, J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 561, 562).—Little association was observed in studies at Cornell University with Ebenezer and Red Wethersfield onions between scale thickness, measured with a micrometer at the point of greatest diameter, and the size of the bulb.

The relative firmness of fifteen onion varieties, R. MAGRUDER and E. Q. KNIGHT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 563-566).—At Arlington Experiment Farm, Va., tests made with a pressure tester equipped with a plunger one-eighth inch in diameter revealed certain differences in firmness of onion bulbs, but as a whole this was not as reliable an indication of firmness as was the squeeze test. The squeeze test showed Yellow Bermuda and California Early Red to be the softest and Australian Brown the hardest of the 15 varieties tested. The differences between different-sized bulbs of the same variety were rarely significant, but when observed the largest bulbs were usually the hardest.

Tomato investigations.—II, Staking and pruning experiments in 1932-33, A. G. STRICKLAND (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 7, pp. 340-342).—Staking and pruning of tomato plants proved of no value with respect to early maturity, size of fruits, or total yield. In 1 of 3 yr. the staked plants produced markedly lower yields than did the decumbent plants.

Potentially unlimited growth of excised tomato root tips in a liquid medium, P. R. WHITE (*Plant Physiol.*, 9 (1934), No. 3, pp. 585-600, figs. 3).—Excised sections of Bonny Best tomato roots taken from seedlings germinated under aseptic conditions and placed in Erlenmeyer flasks containing a nutrient salt solution plus sucrose and yeast were maintained for over a year in the laboratory. During the day the cultures were exposed to diffused sunlight. One culture produced approximately 35,000 growing points and more than 400,000 mm of tissue from an initial section 10 mm long. The author believes that tomato root tips are capable of maintaining an independent apparently normal existence for potentially unlimited periods under the artificial environment employed.

The replaceable potassium content of orchard soils in Maryland as affected by potassium-carrying fertilizers, R. F. CHANDLER, Jr. (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 62-66, fig. 1).—Determinations at the University of Maryland of the replaceable K in four different soils showed much higher contents in clays than in sands. With regard to the three upper 6-in. horizons, the largest amount of replaceable K was in the top layer. This depth effect was most marked in the clay soils, suggesting that the colloidal content may be largely responsible for K fixation. Applications of KCl resulted in a sharp increase in the replaceable K, especially in the upper 6-in. horizon. A very considerable increase in residual K was noted in the clay soils after 4 yr. of K fertilization and to a lesser extent in the sandy types. Despite the low native content of K in certain of the soils, no signs of K deficiency could be detected in the trees, suggesting that the K-supplying power of the soil may not be necessarily associated with replaceable K content.

A study of the effect of various potassium carrying fertilizers upon the growth and yield of apples and peaches, R. F. CHANDLER, Jr. (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 67-69).—Reporting further on a study previously discussed by Weinberger (*E. S. R.*, 64, p. 36), the author states that over a 6-year period K-carrying fertilizers had no consistent effect on growth or yield of apple and peach trees in Maryland. There were definite indications

that trees on different soil types respond differently to fertilizers in various years. This location factor was particularly significant in the case of peaches.

A statistical study of the effect of potassium fertilizers upon the firmness and keeping quality of fruits, J. H. BEAUMONT and R. F. CHANDLER, Jr. (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 37-44).—Records taken over a period of 6 yr. at the Maryland Experiment Station on apples and peaches harvested from fertilizer plats showed a tendency for a lack of potassium in the fertilizer to make the fruits firmer at harvest time, but to soften more rapidly in storage. In the case of Williams apples at picking time, size, color, and fertilizer treatment all had significant effects on firmness, as measured by the pressure test. Random sampling followed by determinations of the various factors affecting firmness by the analysis of variance method is suggested as an effective means of studying problems of this nature.

Fertilizers as related to leaf area in apple production, E. L. OVERHOLSER and F. L. OVERLEY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 52-54).—In fertilizer experiments conducted by the Washington Experiment Station in the Wenatchee Valley with mature Jonathan trees there was noted a fairly definite relationship between the average leaf area per tree and the average terminal growth, average yield, and average size of individual fruits. Trees receiving N had relatively large leaf areas, while those receiving P and K alone had a relatively small leaf area. It is believed that the response to N may have resulted from the increment in total leaf area of the trees. The average percentage of leaf color was lower in the N-treated trees.

Effects of nitrate fertilization on apple fruits, L. VERNER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 32-36).—Investigations carried on by the West Virginia Experiment Station with York Imperial and Arkansas apples harvested from trees receiving large applications of nitrate of soda and from adjacent unfertilized trees showed the fruits of the fertilized trees to be softer at picking time, larger in size, less attractively colored, and to possess a slightly higher nitrogen content. There were no significant differences in respiration rates of fruits from the fertilized and the control trees, but in York Imperial there was a consistent but not significantly greater loss of moisture at room temperature from the nitrated lot. The reverse was true in Arkansas. Nitrate reduced the aromatic constituents of the fruits to the extent that it was possible to distinguish the fruits from the two treatments over a period of several months. Flavor of the control fruits was also superior. Stage of maturity at time of picking was a more important factor in subsequent scald development of York Imperials than was fertilizer treatment. In a single picking from a single tree the shaded fruits were greener, of lower dessert quality, and more susceptible to scald than were the highly colored fruits.

The relation of weather to pollination of the McIntosh apple, R. L. BOYD and L. P. LATIMER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 12-16, fig. 1).—Having noted in 1929 marked differences in the set of fruits from McIntosh flowers hand-pollinated on different days and different times in the day, an intensive study was conducted at the New Hampshire Experiment Station in 1933 with a 14-year-old McIntosh tree inclosed with cheesecloth. Wealthy pollen was used exclusively. On bright, sunny days better sets were obtained with pollination at 5 p. m. than at 8 a. m. Larger sets were secured from pollination during humid, warm days than on dry, bright days. It is considered likely that the stigmatic fluid is dried on warm, bright days. Evidence was seen that heavy rains do not wash pollen from the stigmas to a serious extent. Pollination failure in cloudy weather is believed the result of low temperature that often accompanies inclement periods rather than the lack

of sunshine. The authors point out, however, that the study did not include the effect of weather on insect visitation.

Apple pollination studies in Maryland, S. W. WENTWORTH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 17-21).—Observing that solid blocks of York Imperial apples were not fruiting satisfactorily, controlled experiments were conducted by the Maryland Experiment Station in two orchards, applying several different varieties of pollen. It was proved beyond question that the York Imperial is commercially self-unfruitful, and that various varieties, including Joyce, Jonathan, Melba, Red Duchess, Red Rome, Rome Beauty, Starking, and Wealthy, are satisfactory pollinizers for this variety. Summer Rambo proved of doubtful value. In another experiment Golden Delicious proved to be commercially self-unfruitful but was adequately pollinated by Grimes Golden, Starking, Delicious, Red Duchess, Red Rome, Northern Spy, Melba, and Chango. A list is presented of varieties which fruited well with Golden Delicious pollen.

The effect of various bactericides on the set of fruit and the germination of the pollen of the apple, L. H. MACDANIELS, E. M. HILDEBRAND, and A. B. BURRELL (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 26-31).—Attempts to control fire blight and scab by spraying or dusting while the trees were in bloom led to a study by Cornell University of the effect of various chemicals on pollination. In tests of 10 materials on 14-year-old Northwestern Greening trees in the Champlain Valley, copper sulfate, calcium hydroxide, and Bordeaux mixture were the only substances to cause an apparent reduction in set. In experiments at Ithaca with applications of copper sulfate, calcium hydroxide, Bordeaux mixture, and zinc lime to 20-year-old McIntosh trees in bloom, the only consistent reduction in set was caused by copper sulfate.

Pollen germination studies with apple, pear, and quince conducted by Hildebrand with the same materials employed in the Champlain Valley experiment showed serious reduction in germination with all substances except methyl violet in a concentration of 1 to 100,000. Where germination occurred, the tubes were much shorter than in the controls and in many cases burst while yet short. Better results in the field than in the laboratory are ascribed to the possibility that various sprays did not wet the stigmatic surface but remained in discrete drops between which the pollen grains may have germinated.

Experiments in spraying apples for the prevention of fruit set, E. C. AUCHTER and J. W. ROBERTS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 22-25).—Preliminary studies conducted by the U. S. Department of Agriculture in several States using various materials, including calcium polysulfide, sodium polysulfide, copper sulfate, sodium nitrate, zinc sulfate, and an oil emulsion in an attempt to prevent fruit setting in the apple, gave unsatisfactory results. The materials that prevented setting caused too great injury to the foliage. The same material often caused different effects in different regions, due apparently to a variation in climatic conditions prevailing at the time of application. It is pointed out that one spraying to prevent setting would not suffice, since the fruit buds open at various times on the same tree according to their location.

A two-year study of labor and equipment used in spraying forty-two New Hampshire orchards, E. J. RASMUSSEN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 1-3).—Based on records in 42 apple orchards, the New Hampshire Experiment Station reports that the primary factors which determine the gallons of spray applied per man hour and per machine hour are size of crew, topography, water supply, capacity of the machine and nozzle, and size of the

trees. Size of crew was the greatest influence on the number of gallons applied per man hour and was determined by the time necessary for covering the orchard. For example, scab sprays, because of their limited duration for application, required the largest crew. Orchardists with effective refilling equipment and convenient water supplies were able to apply as many gallons per man and machine hour as those equipped with overhead stationary water tanks. Conditions permitting continuous operation of the nozzles promoted maximum efficiency.

Recent experiments in spray residue removal from apples, F. L. OVERLEY, E. L. OVERHOLSER, and J. L. ST. JOHN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 4-9).—A brief account of the status of investigations at the Washington Experiment Station on the removal of lead and arsenic residues from apples.

Preliminary report on the removal of spray residues from New York apples, W. T. PENTZER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 10, 11).—Methods of removal, relation of spray schedules and materials to removal, etc., are briefly discussed.

Effect of ethylene, ethylene chlorohydrin, and ultra-violet light on carbohydrate content of stored apples, R. B. DUSTMAN (*Plant Physiol.*, 9 (1934), No. 3, pp. 637-643).—Carefully selected Stayman Winesap, Rome Beauty, and Ben Davis apples picked from single trees and stored at from 33° to 36° F. were treated the following March at the West Virginia Experiment Station with ethylene and ethylene chlorohydrin vapors and ultraviolet rays. The actual number of daily treatments was 35, extending over a period of 41 days. After 4 weeks the ethylene-treated apples showed a more rapid change of color, accompanied by considerable softening. By the end of March the chlorohydrin-treated Ben Davis apples showed some scald, and all three varieties were mellowing. A very slight bronzing of the directly exposed surface was the only change in the ultraviolet group. Chemical examination failed to show any material effects on composition or on the pH of the expressed juice as compared with controls. With respect to sucrose, ethylene treatment slightly increased the content in Stayman Winesap, slightly reduced it in Ben Davis, and had no apparent effect on Rome Beauty.

Influence of the rest period on opening of buds of fruit trees in spring and on development of flower buds of peach trees, W. H. CHANDLER and W. P. TUFTS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 180-186, fig. 1).—Observations by the California Experiment Station on peach trees near Los Angeles showed that buds on long, late-growing shoots do not have their rest broken as readily by low temperature as do those on shorter shoots. Following warm winters the contrast was not as striking. The effect of low temperature was shown at Berkeley in Early McIntosh apple trees dug October 1 and stored near 0° C. A tree taken from storage December 23 was in full bloom February 25, whereas a comparable tree left in the orchard did not reach this stage until April 2. Following the warm winter of 1929-30 retarded development was observed on long shoots of Northern Spy, Red Canada, and Cox Orange. The authors suggest that observations on cut shoots are not completely reliable, because the wound actually contributes to the breaking of the rest. Observations on two potted Lovell peach trees, one held at a temperature 15.6° or above and the other near 0°, showed as much development in the buds of the low-temperature tree in 14 days following removal from storage as occurred in the buds of the other tree in the 133 days from October 21 to March 3.

A seven-years' study of the fruit bud level in Elberta, R. L. McMUNN and M. J. DORSEY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 176-179, fig. 1).—

Records taken by the Illinois Experiment Station in an Elberta peach orchard in Johnson County, using unbranched shoots 5 to 8 ft. from the ground as observational material, showed a yearly alternation in high and low fruit bud levels regardless of the crops produced. In years of low level more fruit buds were noted in the middle than at the basal or terminal sections of the shoots. In years of high level the greatest development of buds occurred toward the base. Little evidence was seen that the amount or time of application of fertilizers had much influence on fruit bud level, nor could the variations observed be correlated either with monthly or total rainfall during the growing season.

The relationship between volume and the dimensions of the Elberta peach. R. L. McMUNN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 187-191, fig. 1).—Measurements by the Illinois Experiment Station on random samples of 100 peaches collected from vigorous 7-year-old trees in the university orchard at Olney indicated that in immature fruits neither the length nor thickness volume computed as that of a sphere having these measurements as diameters affords an accurate picture of actual volume as determined by water replacement in a graduated cylinder. Volumes calculated in the same manner from the suture diameter and from the average of the suture length and thickness measurements approached the true volume rather closely, especially as the fruits enlarged. The suture volume was also the most accurate indication of true volume in ripe peaches. Measurements of irregular shaped fruits indicated that if sufficient individuals are included in the sample the irregularities offset one another. Over a considerable range of fruit sizes the suture volume closely approximated actual volume, and led to the conclusion that suture diameter may be used as a reliable index to actual volume of Elberta peaches from June drop to harvest and should be valuable in estimating the rate of increase of fruits which cannot be removed from experimental trees.

Further studies of peach fruit growth. R. V. LOTT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 201, 202).—In these studies at the Mississippi Experiment Station on Hiley and Elberta peaches, it was found that notwithstanding apparent fluctuations in growth rate, growth, as measured by dry-weight increment, proceeds steadily from the time the stone is hard enough to separate from the flesh until full maturity. The stone increased rapidly in dry weight until about 4 weeks before harvest and then decreased. The final swell of the flesh immediately followed the cessation of stone increment, suggesting that stone and kernel are dominant in the peach fruit until their period of greatest metabolism is past. In the stone nitrogen decreased markedly after the maximum dry weight was attained, and starch and hemicellulose also decreased in the late stages. In the kernel, on the other hand, nitrogen, sugar, hemicellulose, ash, and ether extract increased throughout the investigation, suggesting that materials were being translocated from the stone to the kernel and also that the kernel had not reached physiological maturity at harvest. Excepting hemicellulose, all determined constituents increased in the flesh throughout the entire period. In Hiley and Elberta 70 and 81 percent of the sugar in the flesh accrued, respectively, during the period of final enlargement.

Fruit-seed dimensions in Elberta. M. J. DORSEY and R. L. McMUNN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 192-194).—Observations at the Illinois Experiment Station on a random sample of 3,000-odd Elberta peaches, taken from trees included in thinning experiments, again showed (E. S. R., 69, p. 657) that the larger fruits have in general the larger pits but that in fruits of the same suture diameter stone dimensions may vary considerably. Maturing fruits

tended to increase more in thickness than in length or in suture diameter. It was apparent that with one of the outside dimensions known the expectation as to seed or stone size may be accurately forecast.

Size and growth relations of fruit in splitting of peach pits, L. D. DAVIS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 195-200).—Studies begun by the California Experiment Station in 1929 and concerned chiefly with the Tuskena peach, which frequently exhibits a high percentage of split pits, showed a large variation in the amount of split pit produced in different years, among individual trees in the same year, and even among different locations on the same tree. The largest percentage of split pits was produced in a year of very light crop due to spring frosts. In general the measurements and records show a close association between size or growth rate of peach fruits and the occurrence of split pits. However, splitting was not confined to the larger peaches. In general it was apparent that split pit is very closely associated with those conditions which bring about an increased rate of growth of the fruits.

A fertilizer trial with Bartlett pears, E. L. PROEBSTING (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 55-57).—Bartlett pear trees over 25 yr. of age were found in experiments conducted by the California Experiment Station to respond to N applications with increased yields. There was no consistent difference between P and K treatments and the controls. Analyses of the leaves of trees in the various plats apparently indicated that relatively large amounts of P or K applied to the soil do not insure absorption of these elements on certain types of soil. The author points out, however, that since only leaf analyses were made some of the P and K may have remained within the tree itself. In spite of considerable variation in absolute values, the leaves of trees receiving N tended to be higher in N and lower in P than those of the other treatments; yet there was no evidence of a P deficiency as indicated by growth or yield.

Fruit bud formation in brambles, G. F. WALDO (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 263-267, fig. 1).—On the basis for the most part of free hand sections, the author reports that there is a definite tendency in red raspberries for fruit bud formation to begin in the buds at the terminal ends of the canes about the time vegetative growth ceases and to progress downward. In the autumn-fruiting varieties Ranere and Lloyd George fruit buds formed as soon as shoot elongation ceased, but in most varieties, particularly in the zone of maximum fruit production 30 to 50 in. from the ground, differentiation did not show until November or early December. Observations on the same varieties in Maryland and in Oregon indicated that the time of differentiation varies in different sections and that more development takes place in winter in Oregon than in Maryland. Fruit bud differentiation in the lateral or secondary buds followed that of the primary bud, and injury to the primary buds apparently stimulated activity in the secondary buds. Observations on black and purple raspberries and blackberries and other Rubi showed flower bud formation to occur generally in late autumn.

The comparative gross morphology of the raspberry, R. H. SUDDS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 261, 262).—This is a brief discussion of the root and shoot forming habits in the red and black raspberry. In the red raspberry adventive buds developing on the roots explain the spreading tendency of the species. Comparable adventive buds were not found on black raspberry roots.

A preliminary study of the fruiting habit of the black raspberry—*Rubus occidentalis*, G. BEACH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), p. 268).—This paper has been presented in a more complete form (*E. S. R.*, 71, p. 324).

Relation of benzoic acid content and other constituents of cranberries to keeping quality. J. A. CLAGUE and C. R. FELLERS (*Plant Physiol.*, 9 (1934), No. 3, pp. 631-636).—At the Massachusetts Experiment Station, determinations made in the 1931-32 season of the benzoic acid from 22 varieties of cranberries showed a range of 0.029 percent in the Berry Berry variety to 0.091 percent in Early Richards, with an average of 0.065 percent. The total acid range was from 2.08 percent in Berry Berry to 2.8 percent in Smalley Howes, with an average of 2.35 percent. Supported by further records in the 1932-33 season, the authors conclude that the best keeping cranberries are not consistently those with high benzoic acid content but that apparently other factors are concerned. Pectin and soluble solids content did not correlate with keeping quality, but in general a large percentage of varieties with poor keeping qualities had low total acid contents and vice versa. Tests of the preservative power of quinic acid, known to occur as high as 1 percent in cranberries, failed to show any appreciable action on spoilage organisms such as molds and yeast.

Citrus culture in Hawaii. W. T. POPE (*Hawaii Sta. Bul.* 71 (1934), pp. 37, figs. 5).—Devoted largely to the description of varieties of oranges, grapefruit, lemons, limes, and other citrus, this paper contains information on botanical relationships, propagation, culture, control of insect and fungus pests, and on harvesting.

Some effects of thinning orange fruits. E. R. PARKER (*California Sta. Bul.* 576 (1934), pp. 32, fig. 1).—Investigations in 7 orchards (3 of Washington Navel and 4 of Valencia), located on different soil types, showed in the case of healthy, mature trees of both varieties in a year of heavy production a definite tendency for the thinning of young fruits soon after the normal June drop to increase the size of the remaining fruits. This increment increased with the severity of the thinning. However, despite increase in size the total crop was smaller on the thinned trees, and there was no influence on the proportion of fruits in the various grades. The price differential in favor of the larger fruits was not sufficient to offset the effect of the decreased volume.

However, in the succeeding year without further thinning there was a definite tendency for the trees originally thinned in the older healthy orchards to mature a larger volume of oranges than did the controls. The fruit of the treated trees was smaller, but with prices obtaining there was a definitely greater return from the treated trees.

In concluding the author suggests that thinning of orange fruits does not appear to be a logical practice except, perhaps, in some groves with a history of large crops of unprofitable small fruits. Various uncontrollable factors, such as crop failures due to frosts or other unfavorable climatic events, must be considered in the thinning problem.

Comparative yield and tree size of lemons on various rootstocks. H. J. WEBBER (*Calif. Citrogr.*, 19 (1934), No. 9, pp. 233, 257).—The value of sweet orange and rough lemon as rootstocks for the cultivated lemon was indicated in experiments carried on by the Citrus Experiment Station, Riverside, Calif., and in a commercial orchard in Ventura County. Individual tree records taken over three crop seasons showed very marked differences in average yields per tree. For example in Eureka lemons at Riverside there was a range from a maximum of 427 lb. on Bessie Sweet orange to only 39 lb. on Lemon shaddock roots. In the Lisbon lemon the range was from a maximum of 619 lb. on Bessie Sweet to 225 lb. on Siamese grapefruit. Much the same variation was observed in the commercial orchard in Ventura County. The author advises,

however, that since the data were secured on young trees just coming into fruiting they should not be taken as conclusive.

The cross-transfer of water in mature lemon trees, J. R. FURE and C. A. TAYLOR (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 45-51, figs. 2).—Repeated measurements made by the U. S. Department of Agriculture on 30 tagged fruits per tree on 30-year-old lemon trees growing at Corona, Calif., and root pruned to various degrees of severity indicated that there is a ready cross transfer of water throughout the tree. However, the more drastic the pruning the greater was the loss in volume during the day, reaching a maximum of 19.4 percent in one instance. The rate of recovery during the night was not significantly different according to the position of the fruits on the tree. The practical deduction was that where irrigation water is applied on alternate sides of the tree there will be a ready cross transfer, even in mature trees with pronounced ridges extending from the main roots to the main limbs.

Refrigeration and ventilation in transportation of lemons, C. W. MANN and W. C. COOPER (*Calif. Citrogr.*, 19 (1934), No. 9, pp. 234, 257, figs. 3).—Stating that standard ventilation has generally been accepted as sufficient protection for lemons of good shipping quality during transportation to eastern markets, even during the warmer parts of the year, the authors present evidence secured during transcontinental shipments to show that there was a slightly lower loss from decay in refrigerated cars.

Modern coffee planting, E. G. WINDLE (*London: John Bale, Sons & Daniels-son*, 1933, pp. XI+220, fig. 1).—General information is offered on the distribution of coffee growing, varieties, establishment and maintenance of plantations, control of pests, economic factors, and other considerations.

Climbing roses, G. A. STEVENS (*New York: Macmillan Co.*, 1933, pp. 220, figs. 76).—Devoted largely to varieties—their history, characteristics, and value—this book presents also general information on planting, pruning, training, and culture.

Colour in the garden, M. E. STEBBING (*London: T. Nelson & Sons*, [1934], pp. VIII+111, pls. 53).—Flowers of the everyday garden are grouped by colors, with suggestions for desirable color combinations for different seasons and different uses.

Landscape architecture, compiled by K. McNAMARA (*Cambridge: Harvard Univ. School of Landscape Architect.*, 1934, pp. [7]+209).—This comprehensive classified bibliography was prepared in the library of the Schools of Landscape Architecture and City Planning, Harvard University.

The care and repair of ornamental trees in garden, park, and street, A. D. C. LE SUEUR (*London: Country Life Ltd.*, 1934, pp. XIV+257, pls. 35).—Useful information is presented on the planting and care of trees and the treatment of mechanically and parasitically caused wounds.

The third year of growth experiments with pin oaks, D. WYMAN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 58-61).—In this further contribution (*E. S. R.*, 70, p. 785) from the [New York] Cornell Experiment Station, the author points out that N and N plus P fertilizers applied in 1932 had a marked residual response in 1933 despite no further applications. Where fertilizer was applied in 1933 there was a significant increase in the growth of the N plus P trees over the N group. Again it was observed that trees with branches all along the trunk grew considerably more than did those pruned to top branches only. A positive correlation of 0.83 ± 0.02 was determined between branch elongation and diameter increment.

FORESTRY

The theory and practice of silviculture, F. S. BAKER (*New York and London: McGraw-Hill Book Co., 1934, pp. XIV+502, figs. 87*).—Arranged in five parts, (1) plant physiology, (2) forest ecology, (3) systematized silvicultural experience, (4) the forest itself as a source of silvicultural knowledge, and (5) silvicultural literature, this text discusses the principles underlying the growth and reproduction of forest trees and successful managemental practice.

The composition of normal oak forests, A. C. MCINTYRE (*Jour. Forestry, 32 (1934), No. 4, pp. 495, 496*).—As reported by the Pennsylvania Experiment Station, oak stands 10 yr. of age contained approximately 50 percent of other species and the basal area of the associated species was about half of the total. A subsequent rapid decline in basal area of the associated species is attributed to the death of black locust, black cherry, and other less tolerant species.

The expression of dominance after twenty years in a nursery seed bed, J. L. DEEN (*Jour. Forestry, 32 (1934), No. 4, pp. 485, 486*).—Records taken in an abandoned 20-year-old white pine nursery in southern New Hampshire showed only 720 dominant trees per acre out of an estimated original population of over 2,000,000 seedlings. The general character of the dominant trees indicated that white pine possesses inherent characteristics which permit the species to develop a satisfactory stand on good sites irrespective of the original density or uniformity of the stocking.

The relation between acorn weight and the development of one year chestnut oak seedlings, A. L. MCCOMB (*Jour. Forestry, 32 (1934), No. 4, pp. 479-484, figs. 2*).—Careful measurements of 78 chestnut oak acorns collected near Medford, N. J., and the resulting plants, showed a distinct positive relationship between the weight of the acorn and the growth of the resulting seedlings. The correlation coefficients between acorn weight on the one hand and shoot height, leaf area, leaf weight, shoot weight, root weight, and total plant weight of the 1-year seedlings on the other hand were, respectively, 0.79, 0.81, 0.81, 0.82, 0.85, and 0.71.

Soil factors in the failure of lodge pole pine plantings, T. J. DUNNEWALD (*Jour. Amer. Soc. Agron., 26 (1934), No. 7, pp. 586-591, fig. 1*).—Soils collected by the University of Wyoming from four sites, differing sharply in their natural capacity for supporting a growth of pine, were found under uniform conditions in the greenhouse to exhibit marked variation in their capacity to germinate lodgepole pine seeds. Chemical and physical analyses of the soils showed little difference in pH, soluble salts, or free calcium carbonate, but the contents of humus and organic matter varied sharply and were highest in the soil which gave the maximum germination.

Some factors affecting the bark thickness of second-growth longleaf pine, A. L. MACKINNEY (*Jour. Forestry, 32 (1934), No. 4, pp. 470-474*).—Measurements taken in a South Carolina 35-year-old second-growth stand where different burning conditions were available showed that both annual fires and an accidental fire occurring after 14 yr. of freedom reduced bark thickness appreciably. The author believes that this reduction, though small, should be considered in cruising studies in burned-over longleaf pine forests. Data on the trees which had not been burned for 14 yr. indicated that height had little effect on bark thickness, but that diameter was rather closely correlated with bark thickness. To secure a mean double bark thickness accurate to ± 0.1 in. in 99 times out of 100 it was found that a single bark thickness measurement must be taken on 74 3-in., 156 6-in., and 151 9-in. trees.

Methods of breaking dormancy in certain forest trees, P. J. KRAMER (*Jour. Forestry*, 32 (1934), No. 7, pp. 734-741, fig. 1).—At Duke University seedlings of yellow poplar, red oak, and white oak, and twigs of beech and red gum treated during their dormant period with ethylene chlorohydrin were forced into growth considerably in advance of control material. The gain in the case of seedlings ranged from 3 weeks to 2 mo. A combination of exposure to a period of low temperature followed by ethylene treatment gave the most effective results. Yellow poplar kept in the greenhouse in late autumn dropped its leaves as early as plants kept out of doors, but the red oak dropped its foliage a little later than usual. White oak retained its leaves through the entire winter until the new leaves pushed forth.

The significance of the effect of stand density upon the weather beneath the canopy, G. M. JEMISON (*Jour. Forestry*, 32 (1934), No. 4, pp. 446-451).—Statistical analyses of records taken near Priest River, Idaho, on three sites, (1) under dense virgin timber, (2) under partial cover, and (3) in the open, indicated that observed differences in weather and inflammability are actually significant. The forest canopy, by creating more favorable temperature conditions, favored seedlings and planted stock. The fire hazard was sharply reduced because of reduced inflammability due to lower evaporation. A full stand of trees eliminated 90 percent of the critical days during July and August.

Comparative values of certain forest cover types in accumulating and retaining snowfall, W. L. MAULE (*Jour. Forestry*, 32 (1934), No. 7, pp. 760-765, fig. 1).—Studies made by the U. S. D. A. Forest Service during the winter of 1932-33 on the accumulation of snow and its melting rate in various forest cover types near New Haven, Conn., revealed that among conifers white pine permits the greatest accumulation of snow and holds snow for the longest period. Norway spruce, with its comparatively short branches and stiff needles, held a greater amount of snow in the air in a position for rapid evaporation. Hemlock showed little, if any more, capacity for preventing rapid melting than did the hardwoods. In the hardwood group, all stands despite their age permitted practically the same amount of snow to reach the soil. Hardwoods had only a slight influence in retarding the melting snow. A planting program providing for the greatest possible retention of snow is suggested.

Calcium and magnesium losses from cultivation of forest land, J. T. AUTEN (*Jour. Forestry*, 32 (1934), No. 4, pp. 419-424, fig. 1).—Comparative studies of samples of soil collected in several old-growth forests in Ohio, Indiana, Illinois, and Michigan, with that of adjacent cultivated areas showed a definite loss of calcium and magnesium from surface soils as a result of tillage. Apparently cultivation stimulated a rapid oxidation of organic matter, and the carbon dioxide liberated hastened the leaching of the calcium, magnesium, and other soluble elements. The loss of the bases brought about unfavorable changes in physical properties, such as loss of granular structure and an increased tendency to bake and crack. It was found, however, that much of the leached calcium accumulated in the subsurface soils where it should be possible for tree roots to secure their requirements. The author suggests that where the soil is manifestly exhausted a crop of conifers should be planted to prepare the soil for the return of hardwoods.

Caoutchouc, G. HÜBNER (*Kautschuk. Berlin-Steglitz: Chem. Tech. Verlag Dr. Bodenbender*, 1934, pp. XVI+258, pl. 1, figs. 9).—A discussion is presented of rubber production throughout the world, chiefly from the economic viewpoint.

Value of chemical compounds in fire extinguishing, fire retarding, and fireproofing, when applied to vegetable growth, J. J. DAVIS and R. E. BENSON (*Jour. Forestry*, 32 (1934), No. 4, pp. 441-445).—Experiments by the

Los Angeles County, Calif., Forestry Department with many different chemicals and combinations thereof indicated that certain mixtures may be effectively used in extinguishing or retarding fires in forest areas, especially those with a potentially hazardous ground cover of shrubs, grasses, and weeds. Certain of the materials could be distributed as dust by airplanes and others used as sprays.

Ohio Forest News, [September 1934] (*Ohio Forest News [Ohio Sta.], No. 24 (1934), pp. 8, figs. 2*).—Included are items of general interest, such as historical trees in Ohio, planting records for 1934, and a list of cherries, oaks, elms, and other hardwood trees in the Wooster Arboretum.

DISEASES OF PLANTS

The Plant Disease Reporter, September 15 and October 1, 1934 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 18 (1934), Nos. 11, pp. 131-140; 12, pp. 141-158, figs. 6*).—Among other items of current interest, these issues contain the following contributions:

No. 11.—Curly top (western yellow blight) of tomatoes in Utah, by H. L. Blood; occurrence of cabbage yellows (*Fusarium conglutinans*) in Cuba, by F. L. Wellman; oedema on lima bean; cucumber mosaic (virus) in Montana (first report); bacterial stalk rot of corn (*Bacterium dissolvens*) in Indiana (first report), by G. M. Smith; damping-off (*Rhizoctonia solani*) of black locust seedlings in Tennessee; and rose anthracnose (*Sphaceloma rosarum*) in Oregon (first report).

No. 12.—Stewart's disease (*Aplanobacter stewarti* on *Zea mays*) in relation to winter temperatures, by N. E. Stevens, giving evidence that periods marked by abundance of the disease are apparently closely correlated with preceding high winter temperature indexes; "low smut" of wheat (a strain of *Tilletia tritici* particularly virulent on Turkey type wheats, by H. A. Rodenhiser; tobacco wilt caused by *Verticillium albo-atrum* in Tennessee (first report for the United States), by C. D. Sherbakoff; and *Cryptosporium* (*C. minimum*) canker of rose (first report for the United States), by A. E. Jenkins.

[**Plant disease studies in Puerto Rico**] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed., pp. 34-36, 76-91*).—This report contains a brief summary of the results of studies on the relative resistance to sugarcane mosaic of several of the more promising Puerto Rican seedlings and of several imported varieties. It also contains a plant disease survey report for the year and brief reports of projects dealing with gummosis, dry rot, poor germination, root diseases, variegation, and minor diseases of sugarcane, nematodes, white spot of pineapple, and bacterial wilt of the Solanaceae (*Bacterium solanacearum*); the selection and development of disease resistant tomatoes, eggplants, tobacco, and cucumbers; and incidental work.

A list of parasitic fungi collected on Mt. Hayachine, Iwate Prefecture, K. TOGASHI and F. ONUMA (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 17 (1934), pp. 74, figs. 11*).—This list from Japan includes over 180 species, of which 18 species and 1 variety are considered newly recorded for Japan and 11 species as new to science. The latter are illustrated, and Latin diagnoses are given for each. There is a host index, as well as an index to the fungi.

A comparative study of the green-fluorescent bacterial plant pathogens. F. M. CLARA ([*New York*] *Cornell Sta. Mem. 159 (1934), pp. 36, pls. 5*).—Out of 40 reported species of green-fluorescent bacteria pathogenic to plants, the author made comparative studies of 16 species and 2 varieties belonging to the genus *Phytomonas* Bergey et al. along with 3 saprophytic green-fluorescent

species belonging to the genus *Pseudomonas* Migula. Each of these was represented by a single, well-authenticated isolate, except in four cases where one or more additional isolates were included.

Among a good many culture media tested for the production of green fluorescence, the best was found to be a medium composed of 0.5 g magnesium sulfate (anhydrous), 0.5 g dipotassium phosphate (anhydrous), and 5 g asparagine per liter of distilled water, or a medium having twice these quantities per liter, depending on the species cultured.

Seventeen species of plants, nearly all of them being the most susceptible hosts of certain of the pathogens under study, were cross inoculated in the greenhouse with proved virulent cultures prepared in a uniform manner and introduced in a uniform way into cuts in the host tissues. An effort was made to obtain conditions favorable for bacterial invasion and to repeat each test at several different times. The bacterial pathogens found to have a limited host range were *Phytomonas medicaginis phaseolicola*, *P. apii*, *P. lachrymans*, *P. angulata*, *P. marginalis*, *P. viridilivida*, and *P. polycolor*. Those showing a wide range of hosts were *P. syringae*, *P. vignae*, *P. vignae leguminophila*, *P. viridiflava*, *P. cerasi*, *P. trifoliorum*, *P. holci*, and *P. endiviae*. The inoculation results are tabulated.

Extensive culture work disclosed a very close relationship among the bacteria studied, indicating that the green-fluorescent plant pathogens constitute a natural and well-defined group of nonspore-forming rods, motile by one to several flagella, Gram-negative, not acid fast, facultatively anaerobic, turning milk alkaline, producing ammonia in peptone broth, but not producing hydrogen sulfide and indol, or only weakly so, fermenting monosaccharides with the formation of acid but without the production of gas, not hydrolyzing starch and cellulose, a few fermenting rhamnose, and some fermenting sucrose or certain higher carbohydrates, while others do not. It was found that nearly all the plant pathogens fermented sucrose, while only the weak pathogens and non-pathogens did not. Except on the basis of pathogenicity, the three species of *Pseudomonas* included in these tests, *P. aeruginosa*, *P. fluorescens*, and *P. putrida*, could not be separated from the *Phytomonas* group, and of these *Pseudomonas fluorescens* was able to attack pear fruit.

The author holds that, because of their practically identical host and cultural reactions, *Phytomonas vignae* and *P. vignae leguminophila* should be considered as synonyms of *P. syringae*, and *P. trifoliorum* and *P. holci* as synonyms of *P. cerasi*.

A detailed description is given of each species studied, based on the results of the investigation.

Biometrical and biological studies of *Albugo candida* (Pers.) O. Kuntze in connection with its specialization, K. TOGASHI and Y. SHIBASAKI (*Bul. Imp. Col. Agr. and Forestry, Japan*, No. 18 (1934), pp. 88, figs. 7).—Material from over 30 different species and varieties of Cruciferae, including Japanese cultivated varieties, was used in this study of specialization within the species. For measuring conidia on each host, the authors tried to use material collected from a wide range of sources and conditions. Two fairly distinct morphologic types appeared to exist. That occurring on *Brassica* and *Raphanus*, with conidia averaging 20 by 18 μ , is given the variety name *macrospora*. The type occurring on *Cardamine*, *Capsella*, *Draba*, and *Arabis*, with spores averaging 15.5 by 14.5 μ , is given the variety name *microspora*. Inoculation results reveal five distinct physiologic forms, each apparently confined to a distinct host genus.

Inoculations showing the wide host range of *Botryosphaeria ribis*, C. O. SMITH (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 5, pp. 467-476, pls. 3).—Cultures

of *B. ribis* (*Dothiorella* stage) isolated from *Juglans regia*, *Persea americana*, *Citrus limonia*, and *Cocos plumosa* were used at the California Citrus Experiment Station in inoculating, through bark wounds, over 50 species of plants belonging to 39 genera and 20 families. The following successfully infected species are reported as among the additions to the already extensive list of hosts: *Prunus communis*, *P. armeniaca*, *P. avium*, *P. serotina*, *P. domestica*, *P. salicina*, *Eriobotrya japonica*, *Pyrus communis*, *Pyracantha gibbsii*, *P. yunnanensis*, *Cydonia oblonga*, *J. californica*, *J. hindsii*, *J. major*, *J. sieboldiana*, *Annona cherimola*, *Castanea* sp., *Carissa grandiflora*, *Ceratonia siliqua*, *Corylus avellana*, *Diospyros kaki*, *D. lotus*, *Feijoa sellowiana*, *Ficus* sp., *Fraxinus* sp., *Juniperus procera*, *Olea europaea*, *Platanus racemosa*, *Populus fremonti*, *Ulmus parvifolia*, *Cocos bonnetii*, *C. plumosa*, *Erythea edulis*, *Phoenix canariensis*, *P. dactylifera*, and *Washingtonia filifera*.

Autolysis in *Ophiobolus miyabeanus* [trans. title], S. AKAI (*Forsch. Geb. Pflanzenkrank.* [Japan], No. 2 (1933), pp. 257-278, figs. 6; *Ger. abs.*, p. 278).—Studies on autolysis in different media and at different pH values led to the conclusion that the end product is chiefly ammonia, and that the pH of the medium at the time of the highest mycelial weight probably influences the process.

Studies on plant virus diseases.—XI, Further experiments with a ring-spot virus: Its identification with spotted wilt of the tomato, K. M. SMITH (*Ann. Appl. Biol.*, 19 (1932), No. 3, pp. 305-330, pls. 5, figs. 7).—Evidence is presented that a ring spot disease previously described from *Solanum capsicastrum* is identical with the tomato virosis known in Australia as spotted wilt. The insect vector is found to be *Thrips tabaci*, of which the adult ♀ is described (by J. P. Doncaster). It and the first- and second-stage larvae are figured. Transmission experiments with *T. tabaci* were carried out by means of an adaptation of F. F. Smith's feeding cell for leaf hoppers. The device is described. The host range of the virus has been studied, and it has been transmitted to 20 species of the Solanaceae (among them *Solanum*, *Capsicum*, *Nicotiana*, *Datura*, *Hyoscyamus*, *Atropa*, and *Petunia*) and also to lupine, dahlia, *Callistephus*, zinnia, and *Plantago*. The virus was also found naturally occurring in two genera of Campanulaceae and in nasturtium (*Tropaeolum*), and a severe disease was experimentally produced by inoculating it into *Vicia faba*. The symptoms in each host are described. The virus did not pass an L₁ Pasteur-Chamberland candle, and its viability was lost after 4 hr. aging in vitro. The virus of tomato spotted wilt is compared with a tomato virus of the stripe or mosaic type associated with it.

The spotted wilt virus could not be transmitted by thrips larvae until 5 days after they had been placed on the source of inoculum. Noninfective adults were apparently unable to pick up the virus from diseased plants. The author believes that his earlier tests, which pointed to *Myzus persicae* as an occasional vector, were open to question.—(*Courtesy Biol. Abs.*)

The relative influence of calcium and magnesium in Bordeaux mixture on the transpiration rate, II, J. D. WILSON and H. A. RUNNELS (*Ohio Sta. Bimo. Bul.* 170 (1934), pp. 175-179, fig. 1).—Continuing work already noted (*E. S. R.*, 71, p. 785), Bordeaux mixture prepared with a high-magnesium lime changed to a greenish tint, became granular, and settled much more rapidly between a ratio of 2:1 and 3:1 of copper sulfate to lime. A change of similar character did not occur with a high-calcium lime until the ratio was increased to 4:1 from 3:1.

The test for free copper became positive where high-magnesium lime was used when the copper sulfate:hydrated lime ratio reached a value of 8:3, but was

positive with the high-calcium material only at a ratio of 11:3. Copper sulfate injury was noted following the application of a 9-3-50 Bordeaux mixture prepared with high-magnesium lime, but did not occur with one prepared from the high-calcium lime until the formula was 12-3-50 or above. Bordeaux mixture prepared from a high-calcium material was found to have a darker color and to settle out somewhat more slowly than that prepared from the high-magnesium material.

Influence of Bordeaux and oil sprays on the daily curve of transpiration, J. D. WILSON and H. A. RUNNELS (*Ohio Sta. Bimo. Bul.* 170 (1934), pp. 179-186, figs. 3).—Continuing studies already noted (E. S. R., 70, p. 791), the authors set up an experiment to determine the effect of each of these materials on the daily march of water loss from plants of coleus, tomato, cucumber, and potato grown in half-gallon tinned cans. The plants were divided into lots in such a way that the capacity for water loss was practically equal in each lot. One of these lots was set aside for an unsprayed check, the second was sprayed with 3-4.5-50 Bordeaux mixture, the third with oil emulsion (Volck concentrate) 1-125, and the fourth with a mixture of equal parts of these two spray materials. Weighings were made either at 1-hr. or 3-hr. intervals over a 4-day period, except between the hours of 9 p. m. and 5 a. m., and black and white atmometer readings were made at the same time.

Bordeaux mixture and a combination of Bordeaux with oil emulsion caused an increase in transpiration from approximately 4 p. m. to 8 a. m. during the month of March. The oil emulsion used alone caused a decrease in the transpiration rate during all of the day period for each of the four kinds of plants, and also during the night period for coleus and tomato. Oil-sprayed cucumber and potato plants, however, transpired more during the night period than did the checks. When the different sprays were applied to cut-off shoots of the tomato, water loss was found to take place in the same relative order as in the case of the living plants.

Studies on the direct utilization of mineral sulfur in the control of powdery mildew [trans. title], G. MALQUORI (*Ricerca Sci. [Roma]*, 1 (1934), No. 8, pp. 423-433, figs. 4).—The author examined the changes in mineral sulfur in calcareous matrix, in the air, and under the influence of sunlight, comparing its action with that of various commercial types of pure crude sulfur, with the following conclusions:

Pure crude sulfur and mineral sulfur in calcareous matrix oxidize in the air under sunlight, with formation of acid products, H_2SO_4 predominating. During oxidation evidence can be found of the appearance of pentathionic and tetrathionic acids. Pentathionic acid was revealed only by sulfurs of high quality, the tetrathionic by the mineral sulfur. The S_5O_{10} ion decomposes rather rapidly, especially at high temperatures in weakly alkaline media, which holds for the mineral sulfur because of the presence of the calcareous base. The stability of S_5O_{10} is greater under similar conditions, and the disappearance of the two types of ions is accompanied by the appearance of large quantities of S_2O_3 . The author thinks it little likely, however, that the fungicidal action of mineral sulfur with calcareous matrix can be attributed to the toxic action of pentathionic acid, advanced by some investigators to justify the fungicidal power of pure sulfurs.

On the influence of iron sulfate upon the growth and vitality of *Piricularia oryzae*, with special reference to temperature as an environmental factor, T. ABE (*Forsch. Geb. Pflanzenkrankh. [Japan]*, No. 2 (1933), pp. 186-201; *Eng. abs.*, pp. 200, 201).—In potato decoction with 1 percent sucrose, the addition of about 10^{-6} M iron sulfate resulted in more vigorous mycelial growth

at all temperatures used (from 16° to 32° C.). When the medium was solidified with agar, growth was stimulated by the same concentration of iron sulfate only at about 28°, the optimum for growth of the fungus strain used. No growth occurred at any of the temperatures used with $\frac{1}{25}$ M present, while with $\frac{1}{100}$ M or less growth occurred at all temperatures except 32°. Conidial formation and aerial mycelial formation were retarded as the concentration of iron sulfate increased until at $\frac{1}{25}$ M they practically ceased. Formation of chlamydospores increased as the concentration increased, but decreased as the temperatures departed from the optimum for mycelial growth. In higher concentrations colony coloration gradually turned from grayish white to sooty green or greenish yellow.

Studies on powdery mildew of cereals, A. GRAF-MABIN ([New York] Cornell Sta. Mem. 157 (1934), pp. 48, figs. 9).—A study is reported on certain aspects of the physiology of *Erysiphe graminis hordei* and of the interrelations between this parasite and the barley variety Alpha used as the experimental host. It was found that conidia germinated best at 12° C. Germination was much better when the conidia were placed on dry glass slides in moist air or when immersed in 2.5 percent cane-sugar solution than in water. Newly formed conidia germinated better than older ones. Perithecia containing asci but no ascospores, when placed in water at 9° for 12 hr. and then transferred to an incubator at 21°, developed ascospores in 22 hr. Other treatments were less successful. Prior freezing prevented germination at 21°.

No perithecia developed on young barley plants subjected for various periods to various wave lengths of ultraviolet light or to soil and air conditions leading to plant starvation. In tests in which perithecia appeared they were produced in greater abundance on infected areas as the age of the plants increased, but the susceptibility of the plants to infection, and hence the number of infections present, decreased with age. It was demonstrated that the germ tubes of the conidia could not penetrate the cuticle of old barley leaves, although abundant mildew infection was obtained on old leaves when the cuticle was removed and the underlying cells were protected from dying.

Mildewed plants transpired 67 percent more water per unit of leaf area than did healthy plants. The increased transpiration was apparently due mainly to an increase in the opening of the stomata and to evaporation through the aerial mycelium of the fungus. Mildewed plants had fewer and smaller leaves than healthy ones.

On the relation of air humidity to germination of urediniospores of some species of *Puccinia* parasitic on cereals, T. HEMMI and T. ABE (Forsch. Geb. Pflanzenkrankh. [Japan], No. 2 (1933), pp. 1-9; Japan. abs., p. 9).—The urediospores of *P. triticea*, *P. glumarum*, and *P. lolii* were placed on glass slides and kept for 24 hr. at 24°-25° C. in chambers maintained at 100, 99, 95, and 90 percent relative humidity by the use of various percentages of sulfuric acid. Even where dried spores were placed on dry slides, considerable germination took place in all three species in saturated air, while some occurred in all lots at 99 percent r. h. At 95 percent r. h., however, no germination occurred in any lot except for a bare trace on one slide.

Although germination took place as indicated without the presence of visible condensed moisture on the slides, microscopic examination revealed a thin film of condensed water surrounding all the spores which had germinated at 100 or 99 percent r. h. The authors, therefore, hold that direct contact with water is clearly essential for urediospore germination.

A preliminary note on the recognition of flag smut or bunt infection based on the deformation of seedlings, H. R. ANGELL (Jour. Council Sci. and

Indus. Res. [Aust.], 7 (1934), No. 2, pp. 110-112, pls. 2).—Infection with flag smut (*Urocystis tritici*) and infection by bunt (*Tilletia* sp.) were demonstrated by deformation of very young seedlings grown in sterilized soil at 20° and 10° C., respectively. It is held that the total amount of infection may be more accurately determined on this basis than by the usual field counts. By this method it is considered possible to differentiate between resistance to infection and resistance to the development of the disease.

Barley diseases controlled by seed treatment, R. W. LEUKEL and V. F. TAPKE (*U. S. Dept. Agr., Misc. Pub. 199 (1934), pp. [4], fig. 1*).—This leaflet gives brief instructions for the control, by seed treatment, of covered smut, brown and black loose smuts, stripe, and scab seedling blight, with directions for applying the treatments either in dust or liquid form.

On the occurrence, perpetuation, and control of gram (*Cicer arietinum* L.) blight caused by *Ascochyta rabiei* (Pass.) Labrousse, with special reference to Indian conditions, A. SATTAR (*Ann. Appl. Biol., 20 (1933), No. 4, pp. 612-632, figs. 4*).—This disease of gram or chickpea is especially serious in northwestern India, particularly during the blossoming and fruiting period, when wet weather may result in total loss. Experiments showed that increased susceptibility with age was associated with an increase in acid secretion on the leaves, mostly malic acid, which was found to favor spore germination and infection.

The chief local source of inoculum appeared to be infested soil and crop refuse, together with contaminated and infected seed. Tests indicated complete disinfection of contaminated seed with a 10-min. soak in 0.5 percent CuSO_4 and 95 percent kill of the fungus in infected seeds by a 15-min. soak in hot water at 53° C., without injury to germination in either case. Crop rotation and sanitation are advised.

Investigations on the "bakanae" disease of the rice plant, III, IV [trans. title], F. SETO (*Forsch. Geb. Pflanzenkrank. [Japan], No. 2 (1933), pp. 125-153, figs. 2; Ger. abs., pp. 136, 137, 152, 153*).—Two papers are presented.

III. *The relation between soil moisture and the incidence of the disease from soil infection* (pp. 125-137).—Although seed infection is usual in this disease, caused by *Gibberella fujikuroi*, infection from contaminated soil does occur, and the seedlings will show the characteristic bakanae acceleration symptoms in high moisture soils under warm temperature conditions. In dry soils, on the other hand, affected plants as a rule exhibit foot rot symptoms of a growth-retarding sort.

IV. *The relation between soil temperature and the incidence of the disease from soil infection* (pp. 138-153).—In tests involving the use of soil temperature tanks it was found that a soil temperature of 35° C. favors infection as well as seedling growth. At 40° growth was much delayed and the emergence of the diseased seedlings retarded. At 25° the infected seedlings still showed the bakanae symptoms, but not, in general, at 20°. The pathogen, however, was reisolated from nearly 100 percent of the outwardly healthy seedlings grown at 25°. Such occurrences, according to the author, are attributable to the effect of the soil temperature on the seedlings themselves rather than to the virulence of the fungus.

The varying response of rice seedlings to attack by the "bakanae" disease [trans. title], F. SETO (*Forsch. Geb. Pflanzenkrank. [Japan], No. 2 (1933), pp. 20-29; Japan. abs., p. 29*).—In isolation work with rice seedlings extending over 2 yr., the author secured strains of *Fusarium* apparently identical with the one producing bakanae disease (*Gibberella fujikuroi*) from approximately 97 percent of those showing the typical bakanae symptoms, from about 32

percent of the apparently healthy ones, and from about 64 percent of those which were dwarfed and yellowing.

In one test, rice grains from blossoms inoculated with a *Fusarium* strain obtained from a bakanae type plant were planted and grown at constant temperatures of 35°, 30°, 25°, and 20° C. At 35° and 30°, 42.9 and 18.5 percent, respectively, of the seedlings showed the growth acceleration characteristic of the bakanae disease. None showed it at the lower temperatures. At the three lower temperatures 11.1, 14.8, and 13.8 percent, respectively, were dwarfed, but none at the higher. Thus temperature was found to exert a very definite influence on the type of response to infection.

In another experiment with infected seedlings grown at relatively high temperatures, it was found that soil moisture exerted an important influence, the bakanae type of response occurring only when the soil was saturated. In dry soil a growth checking effect was observed.

It was also found that the filtrate from cultures of some isolates of the pathogen accelerated the growth on rice seedlings in the field, while that from another such isolate strongly retarded growth.

The author indicates that the effects of attack by *G. fujikuroi* on the seedlings will depend upon the degree of aggressiveness of the fungus strain involved in relation to the degree of susceptibility or resistance of the plant, as well as upon the type of parasitic behavior (accelerating or retarding) possessed by the pathogen, and will be influenced by the prevailing environmental factors.

On a disease of the rice plant caused by *Gibberella saubinetii*, J. IKEYA (*Forsch. Geb. Pflanzenkrankh.* [Japan], No. 2 (1933), pp. 292-313, pl. 1, fig. 1; *Eng. abs.*, p. 313).—On the basis of similar morphology, physiology, and pathogenicity on rice, it is concluded from these studies, reported in Japanese, that a fungus isolated from a rice seedling is practically identical with strains of *G. saubinetii* isolated from wheat heads. The fungus injured seed germination in rice in soils kept at 28° and 32° C. less than it did in soils kept at 20° and 24°.

On physiologic specialization in the rice blast fungus, *Piricularia oryzae*, S. KONISHI (*Forsch. Geb. Pflanzenkrankh.* [Japan], No. 2, (1933), pp. 55-77, pl. 1, figs. 5; *Eng. abs.*, pp. 76, 77).—The results of culture studies on artificial media and of infection studies with rice seedlings, reported in Japanese, show that this fungus consists of different physiologic forms distinguishable by appearance in cultures, by differences in temperature relations for mycelial growth, and by differences in virulence. Most strains studied developed submerged mycelium well at 32° C., but some grew poorly at this temperature. At 36° some formed good colonies, while others failed to grow at all. Sectoring was met with on agar, the saltant continuing to show the new characters in succeeding conidial transplants. Cultural strains of *P. zingiberi* and *P. grisea* showed no resemblance to any strains of *P. oryzae* used.

On the influence of soil temperature upon the development of the blast disease of rice, T. ABE (*Forsch. Geb. Pflanzenkrankh.* [Japan], No. 2 (1933), pp. 30-54; *Eng. abs.*, pp. 53, 54).—In this work on infection by *Piricularia oryzae*, reported in Japanese, soil temperature tanks were kept at 32°, 28°, 24°, and 20° C., respectively. Soil temperatures at 32° and 28° gave the best germination and growth. At 20° germination was slow and irregular, and etiolation often resulted.

The percentage of infected seedlings and the number of leaf lesions were at a minimum at 28° and at a maximum at 20°. Thus susceptibility seems to be lowest when rice seedlings grow at the optimal soil temperature for growth and increases as the soil temperature becomes more unfavorable for growth. Likewise the lower the soil temperature the more severe is the seedling foot

rot phase of the disease. Low soil temperatures may bring about these results more by reason of their retarding effect on the host than by their influence on the pathogen.

On the relation of atmospheric humidity to the infection of the rice plant by *Piricularia oryzae*, T. ABE (*Forsch. Geb. Pflanzenkrank. [Japan]*, No. 2 (1933), pp. 98-124; *Eng. abs.*, pp. 123, 124).—Rice seedlings grown in water culture were inoculated with a spore suspension and kept for 24 hr. in desiccators in which the air had been adjusted to 100, 92, and 90 percent relative humidities by H_2SO_4 in various concentrations, then were transferred and grown for a week on a greenhouse bench. The lots inoculated and kept in the desiccators in 100 and 92 percent r. h. showed typical lesions of blast disease, while those kept at 90 percent remained healthy.

In another test, drops of a suspension of spores were dried at room temperature and placed in Petri dishes for 24 hr. at 24°-25° C. at different air humidities. At 96 percent r. h. the spores germinated slightly, but not at all at 92 percent. The same was true for the spores of *Peronospora spinaciae*. Drying of the spore suspensions of both these fungi, however, caused a high reduction or retardation of germination. When undried drops of spore suspension were placed under similar conditions, the *Piricularia* spores germinated fairly well at 96 percent r. h., but not at all at 92 percent. A few *Peronospora* spores, however, germinated at 89 percent r. h.

It is deemed reasonable to assume that no infection of rice seedlings by the blast fungus takes place in relative humidities lower than 90 percent.

On the relation of soil moisture to the development of the rice blast disease, with special reference to the results of inoculation experiments on the resistant and susceptible varieties of the paddy rice and the upland rice, H. SUZUKI (*Forsch. Geb. Pflanzenkrank. [Japan]*, No. 2 (1933), pp. 78-97; *Eng. abs.*, p. 97).—Inoculation experiments, reported in Japanese, with *Piricularia oryzae* on a resistant and on a susceptible variety of paddy rice and on two varieties of upland rice grown on soils differing in moisture led to the conclusion that the susceptibility of rice to the blast disease decreases as the soil moisture increases in amount or in duration.

On the relation of soil moisture to the development of the blast disease of rice plant, with special reference to the results of inoculation experiments on seedlings and pedicels of spikes of plants grown on soils differing in the time and duration of drying and irrigation, H. SUZUKI (*Forsch. Geb. Pflanzenkrank. [Japan]*, No. 2 (1933), pp. 172-185, figs. 2; *Eng. abs.*, pp. 184, 185).—In these studies, reported in Japanese, the susceptibility of seedlings and of panicles of rice to *Piricularia oryzae* was found to increase with the duration of dry soil conditions and to decrease with the duration of irrigation, but at the same time to vary with the stage of growth of the rice. The most infection was attained where the soil was not irrigated at all through the growing period, and the least where it was continuously irrigated. There appeared to be a definite relation between susceptibility to blast disease and thickness of the outer walls of the epidermal cells or the amount of silica in them.

On the relation of soil moisture to the development of the blast disease of rice, with special reference to the inoculation experiments on plants grown on soils differing in moisture and amount of nitrogenous manure, H. SUZUKI (*Forsch. Geb. Pflanzenkrank. [Japan]*, No. 2 (1933), pp. 279-291; *Eng. abs.*, p. 291).—Regardless of the amount of nitrogenous manures or the growing period of rice, its susceptibility to *Piricularia oryzae* increased, in these Japanese studies, as the water content of the soil decreased. Seedlings

and adult leaves and rachises of rice grown on flooded soil with a certain amount of nitrogenous manure were more resistant than those on arid soil with half the amount of the same manure. The degree of silicification of adult leaves in the first instance was higher than in the latter. Hence the author concludes that the degree of silicification in the leaf epidermis is correlated with resistance.

Studies on sclerotium diseases of the rice plant, VI—VIII (Forsch. Geb. Pflanzenkrank. [Japan], No. 2 (1933), pp. 202–218, 219–237, 238–256, figs. 2; Eng. abs., pp. 217, 218, 237, 256).—Three papers are given in Japanese.

VI. *On the relation of temperature and period of continuous wetting to the infection of the rice plant by Hypochnus sasakii*, T. Hemmi and S. Endo.—By inserting sclerotia of the fungus between the leaf sheath and culm of full-grown potted plants and placing them in moist chambers running at different control temperatures, later removing them at different intervals to greenhouse stands and taking the sclerotia away, it was found that the optimum temperature for infection was about 28°–32° C., or about the optimum for mycelial growth, with little or no infection taking place at 36° and 24°. The minimum period of continuous wetting necessary for infection was about 18 hr. at 32° and about 24 hr. at 28°. The disease was most severe at 32°. Besides the Japanese strain of the fungus used, a Philippine strain, assumed by another worker to belong to the *Rhizoctonia solani* group, was included in all tests and found to resemble closely the Japanese strain of *H. sasakii*.

VII. *On the influence of continuous wetting and discontinuous wetting on infection of the rice plant by Hypochnus sasakii*, S. Ikeno.—Infection took place in these tests more abundantly the longer the sclerotium was in contact with the host, i. e., under discontinuous wetting and with shorter total time of exposure to moist conditions. When the sclerotium was placed between the leaf sheaf and culm, infection occurred at suitable temperatures under ordinary greenhouse conditions without an external water supply. The minimum incubation period in these tests was from 1 to 3 days.

VIII. *On the relation of temperature and period of continuous wetting to the infection of soybean by the sclerotia of Hypochnus sasakii and on autolysis of the same fungus*, S. Ikeno.—In these tests the minimal periods of continuous wetting necessary for infection of soybean leaves were about 24 hr. at 24° C. and about 18 hr. at 28° and 32°. No infection occurred at 34° and 36°. In cultures of *H. sasakii* on Richard synthetic solution autolysis was clearly recognizable.

Successive body weight determinations on a rusted and a sound wheat plant [trans. title], O. WERNER and H. STEINER (*Biol. Gen.*, 9, pt. 1 (1933), No. 2, pp. 337–354, figs. 8).—Successive weight determinations were made simultaneously on a wheat plant infected with *Puccinia triticina* and on a comparable healthy control plant of the same pure line. This brought out the relation between yield and reduction of physiological activity due to rust attack. In the test conducted, significant reduction of the latter did not occur until long after infection, hence only a slight decrease in dry weight was sustained.

Selenium injury to wheat plants and its inhibition by sulphur, A. M. HURD-KARRER (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 4, pp. 343–357, pls. 2, figs. 4).—In pot tests sublethal concentrations of sodium selenate added to the soil (15 to about 30 p. p. m. selenium in Keyport clay loam) produced a snow-white chlorosis of wheat plants. In sand cultures this symptom was often accompanied by a pink coloration of varying intensity. In water cultures selenium concentrations as low as 0.1 p. p. m. produced distinct injury after a few weeks with nutrient solutions containing no sulfate, whereas a concentra-

tion of 18 p. p. m. was required for this degree of injury in solutions containing 192 p. p. m. sulfur. There was no visible injury where the ratio of selenium to sulfur was 1:12 or less, the point for minimum detectable injury being approximately 1:10. Where the ratio was 1:8 or greater, the plants were chlorotic and stunted, and when the ratio was as high as 1:2, growth was almost completely inhibited.

In soil the injury was inhibited by the addition of excess sulfur either in the form of sulfates or as elemental sulfur. The amount required to offset a given addition of selenate varied with the latter's toxicity in the particular soil involved. Inhibition of injury is accompanied by a reduction in the amount of selenium taken up by the plant. The selenium-sulfur relationship seems to constitute a hitherto unreported instance of antagonism, possibly explainable through application of the laws of mass action, assuming a substitution of selenium for sulfur in some organic compound.

Some factors involved in damage to wheat quality, C. O. SWANSON (*Cereal Chem.*, 11 (1934), No. 2, pp. 173-199).—This contribution from the Kansas Experiment Station reports the results of experiments undertaken to determine the relation of storage conditions to mold development and baking quality. The author stored samples of recently harvested wheat and also of older wheat (5 mo. after harvest), with different moisture contents under three different temperature conditions in gallon glass bottles, some sealed, some cotton-plugged and some well aerated by aspiration for half an hour daily. The condition and quality were determined at intervals for 16 weeks.

Unless inhibited by total exclusion of air from without or by treatment of the seed with an effective fungicide, the higher the storage temperature, the higher the moisture content of the grain, and the longer the period of storage, the greater was the visible mold growth. At 60° F. no mold appeared in wheat with 18 percent of moisture or less. At 95°, however, some appeared in samples containing as low as 14 percent of moisture. Acidity (rancidity) failed to develop when external air was excluded. Diastatic activity was highest in low-moisture wheat, but sugars did not increase until the moisture exceeded 18 percent. The absence of mold or rancidity, however, did not prevent damage to baking quality by storage under high moisture, high temperature conditions.

Nature of injury to forage legumes by the potato leaf hopper, H. W. JOHNSON (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 5, pp. 379-406, figs. 11).—Symptoms almost identical with those caused by the feeding of the potato leaf hopper *Empoasca fabae* were produced artificially by mechanically severing all but one of the vascular bundles in Ladino clover petioles and by girdling Ladino petioles and alfalfa stems with live steam. Leaves reddened and yellowed as a result either of artificial girdling or of leaf hopper feeding were shown to be higher in dry matter, osmotic pressure of cell sap, reducing sugars, sucrose, starch, total acid hydrolyzable substance, and alcohol soluble nitrogen, but lower in total nitrogen than healthy green leaves. The negative results secured from artificial inoculations with juice from yellowed and reddened leaves and from adults and nymphs of this leaf hopper and the failure of symptoms to develop on plants started as shoot cuttings from leaf hopper yellowed and reddened plants and protected from infestation provide further evidence that a specific inciting agent (virus or toxin) is not involved in the production of the symptoms.

It appears that the reddening and yellowing caused by the potato leaf hopper on forage legumes are due to an overaccumulation of the carbohydrate products of photosynthesis above the points where interruption of the functions of vascular tissues is caused by the leaf hopper in its feeding upon the veins of stem tips, petioles, and leaf blades.

Studies in the physiology of the virus diseases of the potato.—[I], A comparison of the carbohydrate metabolism of normal with that of leaf-roll potatoes, E. BARTON-WRIGHT and A. MCBAIN (*Roy. Soc. Edinb. Trans.*, 57 (1932-33), pt. 2, pp. 309-349, figs. 16).—Variations in the carbohydrate content of laminae and petioles of normal and diseased plants of Arran Victory and President potatoes were followed at 19 or 20 successive hourly intervals at different times in the growing season. Variations in radiation and temperature were also measured at the same time.

It was discovered that in healthy plants hexose and not sucrose was the first sugar of photosynthesis while sucrose was the sugar of translocation, there being a high correlation between sucrose in the laminae and sucrose in the petioles. In diseased plants in the "secondary" leaf roll condition photosynthesis was much reduced in the early part of the growing season, the main reactions proceeding in the laminae being conversion of starch to hexose, hexose to sucrose, and sucrose back to starch. The same was true in the "primary" leaf roll condition, except that photosynthesis was not so much reduced. In primary leaf roll hexose was apparently the sugar of translocation, probably traveling down the ground parenchyma and not down the phloem as in normal plants. In leaf roll plants sucrose was never present in the petioles. Later in the growing season the starch content of leaf roll plants was much reduced, while the amount of photosynthesis had increased.

Studies in the physiology of the virus diseases of the potato, II, III, E. BARTON-WRIGHT and A. MCBAIN (*Ann. Appl. Biol.*, 20 (1933), No. 4, pp. 525-548, figs. 12; 549-589, figs. 17).—These two papers continue the series noted above.

II. A comparison of the carbohydrate metabolism of normal with that of crinkle potatoes, together with some observations on carbohydrate metabolism in a "carrier" variety.—In the early stages of Murphy's crinkle (E. S. R., 46, p. 145) on Arran Victory, samples of leaf laminae taken hourly from 2 a. m. to 9 p. m., inclusive, revealed no statistically significant difference in carbohydrate formation as compared with healthy plants. However, the percentages (based on residual dry weight) of hexose, sucrose, and starch were higher in the diseased leaves, and the maximum and minimum percentage points in the crinkle leaves preceded those in the healthy leaves by approximately 2 hr. When both healthy and diseased plants showed marked signs of senescence, sucrose showed a significant increase in the diseased leaves as compared with the healthy leaves, being formed apparently by the hydrolysis of starch, whereas in the healthy leaf a more important method of its formation is its synthesis from hexose which in turn results from starch hydrolysis. Sucrose is held to be the sugar of transport in diseased and healthy plants. In the late stages its passage down the petiole appears to be impeded.

Paracrinkle of R. N. Salaman and R. H. Le Pelley, when carried as a latent virus in the President variety, produced no significant difference in carbohydrate formation from that in healthy plants, either at the beginning or close of the growing season.

III. A comparison of the nitrogen metabolism of normal with that of leaf-roll potatoes.—On two different days in the growing season estimations of the total nitrogen, ammonia N, asparagine N, amino acid N, nitrate N, residual N, and protein N in the leaves and petioles of leaf roll and healthy Arran Victory and President potatoes were made bihourly for 24 hr. Weekly determinations of total nitrogen and the above N fractions in the leaves were also made throughout the growing season.

The statistical evidence, based on associations of fluctuations, indicates that there is apparently no fundamental difference in the nitrogen metabolism of

healthy and leaf roll plants. The formation of nitrogenous compounds is held to proceed along the same lines in both cases. A theory is advanced to account for protein synthesis direct from nitrate N and not via amino acids. It is considered that the residual N fraction plays an important part in nitrogen transport. The gradient for various N fractions from the eye to the medulla of the tuber is presented for leaf roll and healthy plants.—(Courtesy Biol. Abs.)

Potato trial at Palmerston North, 1933-34: A report on the growing of forty-eight lines of commercial seed potatoes, J. H. CLARIDGE (*New Zeal. Jour. Agr.*, 49 (1934), No. 1, pp. 25-30, figs. 2).—In a test of seed potato samples obtained from many different growers, certain varieties appeared to be more susceptible than others to the brown fleck condition, whereas the district in which the tubers were grown did not, from the evidence available, appear to have any influence on the amount of this supposedly physiological trouble in the harvested lots. Correlation between the presence of virus diseases and low yields is reported.

The ecology of seedling beets with reference to diseases: The facultative parasites, their mutual behavior and relations to the host plant, I, II [trans. title], F. NEUWIRTH (*Ztschr. Zuckerindus. Czechoslovak. Repub.*, 58 (1933), No. 13, pp. 97-103; 58 (1934), No. 21, pp. 153-160).—The first part presents a complete list of the organisms which have ever been reported in the literature as being associated with root rot of sugar beets, and adds to it some which have been occasionally isolated from diseased beets and which so far have not been reported, namely, *Acrostalagmus* sp., *Didymium* sp., and *Rhizopus nigricans*.

The second part is summarized as follows: The characteristic disease symptoms of young beet plants, which are produced through the action of the micro-organisms, may also be produced in sterile cultures by unfavorable growing conditions without the action of fungi and bacteria. The microbes attack only seedlings which have been weakened by unfavorable growing conditions. In this way, those micro-organisms which meet with favorable conditions gain the upper hand over their competitors. The products of metabolism which are secreted into the substratum play a very important role in this struggle.

The measures of control must be concerned with the improvement of cultural practices and growing conditions in the field. This necessitates a thorough knowledge of field conditions and of biological principles.—(Courtesy Biol. Abs.)

Parasitism of *Rhizoctonia solani* on sugar beet, E. L. LECLEGG (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 5, pp. 407-431, figs. 6).—Field and greenhouse inoculations showed that *Rhizoctonia* root rot of sugar beets is caused by pathogenic strains of *R. solani* which are distinct from the strains pathogenic to potatoes. Fifty-one isolates from sugar beets and 27 from potatoes from widely different geographic localities were studied, and it was found, by direct inoculation, that those from sugar beets were pathogenic to sugar beets while those from potatoes were nonpathogenic under the same conditions. The sugar beet isolates caused a higher percentage of damping-off of sugar beets and table beets, while both groups of isolates were about equally destructive to alfalfa seedlings. Stunting of host plants was caused by some isolates and not by others.

A marked difference was found in rate of growth of different isolates from beet and potato on the same and different media. The optimum temperature for growth on artificial media for some isolates is 25° C., while for others it is 30°. Low temperature (1°) inhibits growth without causing permanent injury to the fungus. It was found that 5 isolates grew over a wide range of H-ion concentrations, the optimum for 1 being about pH 5.6 and for the 4 others

pH 6.2. A soil temperature of approximately 25° to 33° was most favorable for the production of *Rhizoctonia* root rot of sugar beets by one of the isolates from the same host.

Studies on the stem rot (split stem) of sweetpotatoes, T. HEMMI and T. WATANABE (*Forsch. Geb. Pflanzenkrankh. [Japan]*, No. 2 (1933), pp. 314-327, pl. 1; *Eng. abs.*, pp. 326, 327).—This disease caused by *Fusarium*, and very destructive in certain districts in Japan, was previously considered as due to *Nectria (Hypomyces) ipomoeae*. The conidial characters of the isolates which the authors studied, however, differed from those of *N. ipomoeae* and resembled those of *F. batatas* and *F. hyperoxysporum*. In stem infection experiments, soil infection through wounds seemed to occur best at 32° C. and a little more readily in plants grown on arid than on moist soil.

The influence of the basicity of the soil on tobacco and some other tropical crops in Deli in respect to growth and to slime disease [trans. title], J. VAN DER POEL (*Bul. Deli Proefsta. Medan*, No. 31 (1934), pp. 64; *Eng. abs.*, pp. 59-62).—The three principal soils of the Deli tobacco belt were rendered more acid by adding flour of sulfur, and less acid by adding hydrated lime and marl in various amounts. Peanuts, soybeans, rice, castor-bean, tobacco, and maize were then planted. It was found that maize preferred an alkaline reaction. The rest produced their best growth on slightly acid or neutral soil, although good results were also obtained on alkaline soil. Deli tobacco grew best on slightly acid soil, and the more acid or the more alkaline the soil was made the worse was the growth of the tobacco. The varying responses of the different crops are described.

Slime sickness (*Bacterium solanacearum*) did not appear on tobacco or castor-bean on soil made strongly acid with sulfur or strongly alkaline with lime, nor did it reappear in soils so treated on changing back the soil reaction to one favorable to the disease. Potassium bicarbonate and tobacco ash added to slime-sick soil eliminated the trouble, proving that other alkaline materials besides lime will suppress the disease.

Top sickness (boron deficiency?) seemed to require strongly alkaline soil for its appearance. None occurred at pH 7.0 or 7.55, while at 7.9 or 8.0, up to 90 percent of the plants were affected.

Root knot nematode attack on *Mimosa invisa* and on tobacco was partly or entirely suppressed by adding sulfur to badly infested seed bed soil and giving 5 mo. rest.

The etiology and control of chile wilt, produced by *Fusarium annuum*, R. F. CRAWFORD (*New Mexico Sta. Bul.* 223 (1934), pp. 20, figs. 6).—This bulletin summarizes the results of investigations extending over a number of years. The symptoms and effects of the disease, its mode of dissemination, the causal fungus, and the relation of temperature, soil moisture, and cultural practices are described.

Sudden wilting of the lower leaves of the chili plants [*Capsicum annuum acuminatum*] is followed by death and browning of the foliage. At the base of the stem, gradually girdling, brown cankers are formed. Attacked root tissues soften, appear water-soaked, and eventually, along with the stem tissues, turn dark brown. Wilting of the plants was found not to be caused by a plugging of the water-conducting tissues but by a breaking down and disintegration of the invaded tissues.

It was found that the fungus can live indefinitely in the soil, and that it is spread with loose soil during sand storms and also by irrigation water. Tests indicated that the disease is not seed borne. The fungus was found to be very susceptible to changes in temperature. The optimum was apparently about

27° C., and little growth took place at 17°. The experimental data show very clearly the advantage of the furrow-ridge system of culture over the level method in reducing the percentage of plants attacked by chili wilt, the soil temperatures in the root zone under the furrow-ridge system being lower and more unfavorable for the fungus than with level culture.

On the basis of the results obtained in all plats over a period of 7 yr., the lowest percentage of soil moisture and wilt occurred in the furrow-ridge plats irrigated at 21-day intervals. It was found that when the soil moisture exceeds 12 percent a considerable amount of wilt is to be expected. The furrow-ridge system of culture, the avoidance of heavy soils, and the provision of good drainage are advised as means of reducing the disease.

Bottom rot of lettuce, G. R. TOWNSEND ([*New York*] *Cornell Sta. Mem.* 158 (1934), pp. 46, figs. 13).—This disease, considered the most serious cause of loss to lettuce growers in New York State, is described. The results are reported on the host and environmental relations of the pathogen (*Rhizoctonia solani*), and on control methods.

Isolates of *Rhizoctonia* from various species of plants vary greatly in the aggressiveness of their attack on lettuce. A strain isolated from lettuce damaged lettuce more severely than it did certain other well-known hosts of *Rhizoctonia*, some of which were hardly attacked, or not at all, in these tests. No resistant or immune varieties of lettuce were found, though some varieties tended to escape infection because of their upright growth.

It was found that the fungus entered the leaf both by penetrating the cuticle and by passing through stomata. It survived unfavorable conditions by producing sclerotia and resistant mycelium. In culture, the optimum temperature for growth was found to be about 26° C. (79° F.). There was little growth below 10° C. or above 32°. The mycelium was killed by exposure to 38° for 3 days. With high soil moisture and high relative humidity of the air, the growth of the fungus was favored, and the disease made its appearance within 48 hr. after inoculation. It was most severe in the field when the mean daily temperature was above 19.5° and the daily minimum temperature was above 10°. Wet weather favored the disease, but was not so essential as high temperatures and a plentiful supply of soil moisture which maintained humid conditions under the lettuce heads. Soil temperature within limits did not influence bottom rot but had an effect on damping-off caused by the same pathogen.

The fertilizers used did not influence the incidence of the disease in muck soil, except that increased size of the plants favored bottom rot. Crop rotations, the removal of all crop refuse, the use of green manures, and careful cultural practices were found to help reduce the losses caused by bottom rot. None of the copper or sulfur fungicides tested proved toxic to the fungus or controlled the disease. Mercuric oxide, calomel, and ethyl mercury arsenate were found effective in controlling bottom rot, but injured the crop. Ethyl mercury phosphate, however, when used in a 2.42 percent concentration at the rate of 20–25 lb. per acre and dusted under the plants from 7 to 17 days before harvesting gave excellent control. Special traction dusters devised for applying this fungicide are described.

Leaf mold resistance in the tomato, L. J. ALEXANDER (*Ohio Sta. Bul.* 539 (1934), pp. 26, figs. 5).—This bulletin reports the progress made in the selection and breeding of tomatoes (*Lycopersicum esculentum*) for resistance to *Cladosporium fulvum*. About 180 commercial varieties were tested for resistance by a uniform technic. Of these only 5 showed resistance, but this was partial and did not prevent serious attack following a prolonged infection period. In one of these, Stirling Castle, resistance appeared from the progeny

records to be recessive. In another, Satisfaction, it appeared to be dominant. None of the 5 was considered suitable for further breeding work.

The Red Currant tomato (*L. pimpinellifolium*=*Solanum racemigerum*) proved highly resistant, as did two off-type tomato plants (perhaps hybrids of this species with common tomato) found among plants of the Globe variety. One of these off-type plants, through selfing for four generations, gave rise to four F_4 progenies apparently homozygous for resistance. The high type of resistance in this strain was shown to be dominant. It was, therefore, used in crosses with desirable commercial varieties. Encouraging progress is reported toward combining in this way effective resistance to leaf mold with satisfactory vegetative and fruit characteristics which the parent strain lacked.

Studies on resistance of apple and other rosaceous plants to fire blight, L. SHAW (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 4, pp. 283-313, figs. 14).—In studies conducted on nursery trees in pots in a greenhouse at the Wisconsin Experiment Station, measurements were made of the fire blight resistance of 31 rosaceous species involving the following genera: *Amelanchier*, *Aronia*, *Cotoneaster*, *Crataegus*, *Malus*, *Pyrus*, and *Sorbus*. Differences in resistance were as marked between species of the same genus as they were between genera. As a group, the plants belonging to the genus *Malus* were the least resistant to blight. Of the four varieties of *M. malus* studied most intensely, Northwestern Greening was the most resistant and Yellow Transparent the least. McIntosh and Wealthy were intermediate, with McIntosh characteristically the more resistant. Increased fire blight resistance in apple shoots was favored by (1) increasing age, (2) low soil nutrients, (3) low and high soil temperatures, (4) high atmospheric temperatures, and (5) by low soil moistures. Increased susceptibility was favored by the intermediate or opposite conditions. Brief exposures of plants to a high atmospheric humidity very greatly reduced fire blight resistance. The cork layers formed at the margins of fire blight lesions appeared to be relatively effective barriers against further advance of the pathogen in the tissues. Rapid corking off of blight lesions was found to be associated with increased blight resistance.

The relation of the growth status of apple and pear trees to injury by fire blight, M. A. BLAKE (*New Jersey Stas. Circ.* 327 (1934), pp. 4).—In a popular discussion, the author holds that periodic fire blight outbreaks in New Jersey are associated with the general effects of periodic climatic changes upon the growth status of the host trees. The effect of climatic changes and of soil conditions on blight susceptibility are discussed. The grower is advised to avoid an excessively high N, low carbohydrate status by adjusting his cultural, pruning, and fertilizing practices to that end.

Control of the blossom blight stage of fire blight, H. R. ROSEN (*Science*, 76 (1932), No. 1976, pp. 447, 448).—In this work at the Arkansas Experiment Station, a block of 167 Jonathan trees was selected in which 95 and 60 percent of the blossom clusters had blighted in 1930 and 1931, respectively. About two-thirds of the trees were sprayed with Bordeaux mixture (about 1-2-50) five times as follows: In the pink bud stage, at the time one-fourth of the blossoms were open, at the time four-fifths were open, at the time about seven-eighths of the petals had fallen, and about 19 days later. The rest of the trees were sprayed with lime-sulfur 1.5-50 in the usual three applications. Before the end of the first week in May the lime-sulfur sprayed trees showed more or less blossom blight in nearly every tree, while the Bordeaux mixture sprayed trees were entirely free from blight.

Apple scab control, F. D. FROMME (*Va. State Hort. Soc. Rpt.*, 38 (1933), pp. 142-149).—This contribution from the West Virginia Experiment Station is

a popular discussion of apple scab. Rainfall data from 1918 to 1933 for April and May at Winchester, Va., were correlated with the severity of scab infection. Variations in April rainfall were apparently of no significance, but severe infection occurred when the May total was above normal. The character and duration of the rainfall and relative abundance of overwintering inoculum were important.

The phoney peach and other peach diseases in Virginia, R. H. HURT (*Va. State Hort. Soc. Rpt.*, 38 (1933), pp. 64-69).—This is a popular discussion of the phoney peach disease, not known at the time to occur in Virginia. It also describes the peach brown rot and bacterial shot hole situation in Virginia.

The effect of ammonium bi-carbonate on the storage of oranges, A. GRASOVSKY and M. SHIFF (*Hadar*, 7 (1934), No. 7, pp. 168-172, figs. 4).—In tests extending over two seasons, the use of crystals of ammonium bicarbonate lengthened the keeping period of sound, cull, and bruised oranges, as well as of those from trees affected with *Diplodia* or those inoculated with *Penicillium digitatum* and *P. italicum*. The effect was greatest when the chemical was put into the wrappers, and its effect diminished with its distance from the fruit. Physiological break-down of the peel was increased, but in all cases the beneficial effects were greater than the loss due to break-down.

The foliar reddening of the kaki (Japanese persimmon).—First note [trans. title], O. SERVAZZI (*Bol. Lab. Sper. Fitopat.* [Torino], 29 (1934), No. 4, pp. 122-137, figs. 5).—The redness of the leaves of *Diospyros kaki* was found associated with the presence of a fungus described as *Coryneum dellearii* n. sp., of which a Latin diagnosis is given. The conidia are broadly fusoid, straight or slightly curved, 5-septate, 37-40×10-11.5 μ , the apical hyaline cell usually being curved into the form of a hooked beak. Cultural characteristics are given. Artificial infection of old leaves was unsuccessful. The fungus is considered a saprophyte which under certain conditions may become parasitic. It is supposed that the fungus overwinters on dead leaves on the ground in the conidial state.

Studies on septorioses of plants.—V, *Septoria menthae* (Thüm.) Oud. causing the serious leaf-spot disease of cultivated mints in Japan, T. HEMMI and S. KURATA (*Forsch. Geb. Pflanzenkrankh.* [Japan], No. 2, (1933), pp. 10-19, figs. 6; *Japan. abs.*, p. 19).—This disease, common and destructive throughout Japan, is described. Morphologic and cultural characters of the causal fungus are given. On artificial media, the best growth took place at about 24°-28° C. Little or none occurred at 36° and only slight growth at 5°. In greenhouse inoculation tests the incubation period was about 12 days under temperature conditions varying from 11° to 27°.

This is a continuation of studies reported elsewhere (*E. S. R.*, 69, p. 229).

Sclerotium stem rot of delphinium and other ornamental plants in Trinidad Valley, Mountain Province, Philippine Islands, T. G. FAJARDO (*Philippine Jour. Sci.*, 51 (1933), No. 4, pp. 447-456, pls. 8).—The author found a stem rot, widely distributed in Luzon, attacking delphinium, carnation, amaryllis, *Watsonia*, petunia, Amazon lily, and a palm (*Adonidia merrillii*). It was caused by a fungus considered from its cultural and morphological characteristics to be *S. rolfsii*.

Physiologic investigations on *Ceratostomella ulmi*, M. S. J. LEDEBOER (*Physiologische onderzoekingen over Ceratostomella ulmi* (Schwarz) Buisman. *Proefschr.*, Rijks-Univ., Utrecht, 1934, pp. [7]+95, figs. 8; *Ger. abs.*, pp. 89-91).—The author studied the physiological characteristics of the fungus responsible for the well-known elm disease, chiefly by the use of synthetic nutrient solutions. At 8.5° C. the fungus grew fairly well. The optimum was about 25°

and the maximum about 34°. The portion of sunlight which is not absorbed by ordinary glass was especially favorable to the formation of coremia. The optimum pH for ordinary nutrient solutions was around 6 to 7, the minimum being about 5, and the maximum about 8, but when peptone was present growth was still possible at pH 3.6.

The author describes the effects on growth of various C and N sources and also of the elements K, Na, Mg, Ca, Zn, Fe, Cu, Mn, and Hg in various forms. Bios accelerated growth at the beginning but did not result in maximum yield, due to the development of autolysis. Tannin did not stimulate growth.

The chemical materials tested as possible control agents produced very strong injury to the elms at the lowest concentrations which would check the growth of the pathogen.

Studies in the physiology of wood-destroying fungi.—I, The effect of nitrogen content upon the rate of decay of timber, W. P. K. FINDLAY (*Ann. Bot. [London]*, 48 (1934), No. 189, pp. 109–117).—"The early theories regarding the influence of albuminous substances upon the decay of wood are briefly reviewed. Experiments are described in which small blocks of the wood of Sitka spruce (*Picea sitchensis*) and of beech (*Fagus sylvatica*) were treated with various concentrations of nitrogenous substances and exposed to the attack of the fungi *T[rametes] serialis* and *P[olystictus] versicolor* growing under controlled conditions. The results obtained showed that ammonium nitrate in low concentrations slightly increases the rate of decay of the spruce wood by *T. serialis* and possibly of beech by *P. versicolor*. Treatment of Sitka spruce with organic sources of nitrogen caused a large increase in the loss of weight due to decay, specimens treated with 1 percent peptone losing 40.82 percent as compared with a loss by the controls over the same period of 25.83 percent."

Studies on Polyporus mikadoi and P. patouillardii causing the heart rot of deciduous trees, T. NOJIMA (*Forsch. Geb. Pflanzenkrank. [Japan]*, No. 2, (1933), pp. 154–171, pls. 2, figs. 4; *Eng. abs.*, pp. 170, 171).—Sporophores of *P. mikadoi*, mostly imbricate, often grow on the sides of trunks of almost dead or weakened cherry trees. Those of *P. patouillardii* occur on the trunks or butt sections of living *Pasania cuspidata*, *Quercus gilva*, and *Q. glauca*. Both fungi are lignin-dissolving and produce small white pockets in the wood.

The results of microscopic studies and of culture studies on artificial media are reported in Japanese. The optimum temperature for growth appeared to be about 30° C. for *Polyporus mikadoi* and 28° for *P. patouillardii*.

On Stereum induratum and Trametes dickinsii causing dry rot of fagaceous woods, T. HEMMI (*Forsch. Geb. Pflanzenkrank. [Japan]*, No. 2 (1933), pp. 328–333, pl. 1, figs. 2; *Eng. abs.*, p. 333).—*S. induratum* is widely distributed near Kyoto and in Shikoku, causing a white pocket wood rot chiefly of *Quercus gilva*, *Q. stenophylla*, and *Q. myrsinaefolia*.

T. dickinsii causes a brown cubical rot, is widely distributed throughout Japan, and is limited in the author's collections to species of *Quercus*, *Castanea*, *Fagus*, and *Pasania*.

The interrelationships of bark beetles and blue-staining fungi in felled Norway pine timber, J. G. LEACH, L. W. ORR, and C. CHRISTENSEN (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 4, pp. 315–341, figs. 13).—A study of two species of bark beetles (*Ips pini* and *I. grandicollis*) and the fungi associated with them was made as part of a general study, at the Minnesota Experiment Station, of the interrelations of insects and fungi in the deterioration of felled Norway pine logs. Experimental proof is presented that these bark beetles introduce blue-staining fungi into the logs and that the fungi are rarely, if ever, introduced in any other way. The most prevalent of these fungi was *Ceratostomella*

ips. A second blue-staining fungus, apparently not previously reported, is briefly described as *Tuberculariella ips* n. sp. Characteristic yeasts also were constantly associated with the beetles. The methods of dissemination as determined by cultural and histological means are described.

Plant parasitic nematodes and the diseases they cause, T. GOODEY (London: Methuen & Co., 1933, pp. XX+306, figs. 136).—The author has collected and made available in concise form a large amount of important information on this subject which hitherto has been difficult of access because widely distributed chiefly as separate papers in the scientific and technical literature. In its taxonomic treatment it reflects many necessary recent changes in nomenclature.

The bulk of the book deals with the individual parasitic species, in each case giving the synonymy and discussing in separate paragraphs, as far as existing knowledge permits, such subjects as the historical status, morphology, life history, symptoms, pathology, encystment, dormancy, dispersal, movement in the host, movement in the soil, passage through animals, temperature reactions, moisture relations, natural enemies, hosts, geographic distribution, and methods of control.

Chapter 1 outlines the usual technical methods for the examination and manipulation of plant parasitic nematodes, describes the basic nematode structure, indicates the method of using conventional signs and measurements to make a convenient, compact descriptive formula, and lays down the fundamental structural differences which distinguish the main genera with which the book is mainly concerned.

Chapter 2 discusses species of *Anguillulina* causing galls on shoot structures; chapter 3, species of *Anguillulina* parasitic on shoot structures; chapter 4, root parasites—species of *Anguillulina* and *Tylenchulus semi-penetrans*, the citrus root nematode; chapters 5 and 6, root parasites—species of *Heterodera*; and chapter 7, species of *Aphelenchoides*. Chapter 8 treats of nematodes other than obligate parasites, which are sometimes to be found living in or upon plant tissues. Chapter 9 deals with biologic races in plant parasitic nematodes, using *Anguillulina dipsaci* and *H. schachtii* as examples.

References to pertinent contributions in scientific literature follow each chapter. There is an excellent analytical general index, which includes the names of those whose work is cited in the text.

The root-knot nematode, *Heterodera radiculicola* (Greef) Muller, of tomato and other plants in the Philippine Islands, T. G. FAJARDO and M. A. PALO (*Philippine Jour. Sci.*, 51 (1933), No. 4, pp. 457-484, pls. 8).—The root knot nematode *H. marioni* (*H. radiculicola*) is reported as common and widespread in the Philippines, although thus far not a limiting factor in the production of any important crop. No evidence of diverse biologic strains has been found. Infection was obtained at any soil moisture capable of supporting plant growth, whether very wet or very dry. The percentage of infection was greatly decreased when the soil was kept flooded for 35-40 days. Air-drying freed the soil from nematode infestation in 25-35 days. Larvae were killed within 10-15 min. by drying in the laboratory, the young larvae succumbing in 3 min., but remained alive after being suspended in water for 35 days.

All of the American and Philippine tomato varieties tested were susceptible, but the wild, small-fruited type showed some resistance. Rice, corn, garlic, onions, sincamas, and seguidilla were found highly resistant.

A number of common economic crops and weed species in the Philippines are reported for the first time as susceptible hosts.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the State game warden of Maryland, E. L. LeCompte (*Md. Conserv. Dept. Ann. Rpt.*, 11 (1933), pp. 73-122, figs. 4).—Included in this report is a discussion of game conditions in Maryland in which bobwhite, rabbits, wild turkey, ruffed grouse, deer, woodcock, railbird, imported pheasants, squirrels, doves, wild fowl, and muskrat are considered. The Annual Report of [the] Muskrat Investigation Laboratory, Church Creek, Md., by F. R. Smith (pp. 96-101); Propagation of Bob-white Quail by Electricity, October 1, 1932, to September 30, 1933 (pp. 101, 102); and account of work at the Gwynbrook State Game Farm No. 1, by C. J. McPhail (pp. 102-111), are incorporated in the report.

Hints on live trapping, T. H. Scheffer (*Jour. Mammal.*, 15 (1934), No. 3, pp. 197-202, figs. 5).—Methods in the live trapping of animal pests are described and illustrated.

Burrows and burrowing habits of the Douglas ground squirrel, E. R. Edge (*Jour. Mammal.*, 15 (1934), No. 3, pp. 189-193, pl. 1, fig. 1).—The author reports upon studies of *Otospermophilus douglasii* conducted in the general region of Eugene, Oreg., where during the years 1929-30, 14 burrow systems were dug out in a variety of habitats. Certain areas of the State favorably located with respect to availability of food, suitability for burrows, and freedom from disturbance by enemies are said to support relatively dense populations of this rodent.

Color changes in snowshoe hares, S. Hadwen (*Canad. Jour. Res.*, 10 (1934), No. 5, pp. 539-556, figs. 46).—Observations of the color changes in *Lepus americanus virginianus* in Ontario here recorded have shown that "the production of pigment may be influenced by the fact that the hares can have more than one litter per season. The skin is thicker in the unprime condition than in the prime. From a study of melanin formation in the hair roots it was found that there are produced in succession several kinds of pigments which form the color pattern in the full-grown hair. The structure, percentages, and types of hair are discussed. Kempy fibers are recorded. A different type of hair on the soles of the feet is described. This hair apparently grows independently of the hair on other parts of the body. Reasons are given for the erectness of winter fur as opposed to flat-lying young summer fur. Hares were clipped on one side of the body. In two cases the regrowth of fur produced bands of color and then whitened above; the hairs were identified by the cut ends. Dyeing experiments showed that when brown hair whitened it lost part of its own natural pigment and the dye as well. In two cases where the tips of the hairs had been cut, the dye ran inside and permanently marked them."

Ranaculture, I. G. Schorsch (*Philadelphia: George H. Buchanan Co.*, 1933, pp. IX+87, [pls.] 2).—This is a practical account of the frog, its culture, ability and adaptability, and the commercial aspects of ranaculture. A bibliography of 85 titles, tables giving the generic characteristics of Amphibia and of Ranidae, a key for the identification of the several species of the genus *Rana*, detachable tables for the identification of new amphibian species, and tables showing the maximum number of eggs deposited, tadpole transformations, rate of growth of frogs based on 10-yr. averages, size of full-grown edible frogs, weights of live male bullfrogs and of the edible portions of dressed meat, and output of frogs legs in 1908, 1922, and 1931 are included.

[Contributions on animal parasites] (*Helminthol. Soc. Wash. Proc.*, 1 (1934), No. 2, pp. 31-34, 36-52, 62-66, figs. 11).—Among the contributions here presented relating to helmintho- and ecto-parasites (*E. S. R.*, 71, pp. 808, 809)

are the following: Losses among Wild Ducks Due to Infestation with *Sphaeridiotrema globulus* (Rudolphi) (Trematoda: Psilostomidae) (pp. 31-34) and A New Term [Haptor] for the Adhesive Organs of Trematodes (p. 34), both by E. W. Price; A New Trematode, *Notocotylus hassalli* n. sp. (Notocotylidae), from a Meadow Mouse [*Microtus pennsylvanicus pennsylvanicus*], by A. and G. E. McIntosh (pp. 36, 37); A New Variety of *Alloionema* (Nematoda: Diplogasteridae) [*A. appendiculatum dubia*], with a Note on the Genus, by B. G. Chitwood and A. McIntosh (pp. 37, 38); *Dicelis nira* n. sp. (Nematoda: Drilonematidae) [Parasitic on Earthworms], by B. G. Chitwood and J. T. Lucker (p. 39); The Incidence of Worm Parasites in Swine in the Southern United States (pp. 40-42) and the Effect of Copper Sulphate on Infective Larvae of the Nematodes *Stephanurus dentatus* (Stephanuridae) and *Oesophagostomum* spp. (Strongylidae) (p. 42), both by L. A. Spindler; Observations on Stephanofilariasis in Cattle, by G. Dikmans (pp. 42, 43); The Nematode Genera *Hystrignathus* Leidy, *Lepidonema* Cobb, and *Artigasia* n. g. (Thelastomatidae), by J. R. Christie (pp. 43-48); Recent Records of the Gizzard Worm, *Acuaria anthuris* (Rudolphi, 1819) (Nematoda: Acuariidae), with Observations on Its Life History (pp. 48, 49) and Orthopterans and Pigeons as Secondary and Primary Hosts, Respectively, for the Crow Stomach-Worm, *Microtetrameres helix* (Nematoda: Spiruridae), both by E. B. Cram (p. 50); Coexistence of Adult Male and Female Tetrameres (Nematoda: Spiruridae) in Proventriculus of the Florida Grackle [*Quiscalus quiscula aglaeus*], by E. E. Wehr (p. 50); Egg production by *Nematodirus* spp. (Trichostrongylidae) and by *Chabertia ovina* (Strongylidae) Following Repeated Experimental Infections of Sheep with These Nematodes, by J. S. Andrews (p. 51); Observations on the Development to Egg-Laying Maturity of *Gongylonema pulchrum* (Nematoda: Spiruridae) in the Guinea Pig, by J. E. Alicata (pp. 51, 52); Cysticercoids of the Crow Cestode, *Hymenolepis variabilis* (Mayhew, 1925) Fuhrmann, 1932 (Hymenolepididae), by M. F. Jones (pp. 62, 63); New Bird Hosts [*Dumetella carolinensis* and *Hylocichla* sp.] for the Acanthocephalid *Plagiorhynchus formosus* (Echinorhynchidae), by E. Cu villier (p. 63); New Records of Helminth Parasites (pp. 63, 64) and Nasal Granuloma in Cattle (p. 64), both by G. Dikmans; The Suborders and Superfamilies of Acarina (pp. 64, 65) and The Identity and Proper Scientific Name for the Sucking Louse of North American Domesticated Pigs [*Haematopinus adven ticius chinensis* Fahrenholz] (pp. 65, 66), both by H. E. Ewing; and A Case of Prolonged Cecal Coccidiosis, by E. A. Allen (p. 66).

Development of the human hookworm, *Necator americanus*, in guinea pigs, B. SCHWARTZ and J. E. ALICATA (*Amer. Jour. Hyg.*, 20 (1934), No. 2, pp. 317-328, figs. 2).—The authors have found guinea pigs to be susceptible to infection with *N. americanus* when the latter are administered by mouth or placed on the denuded skin. "Irrespective of the path of entry, the larvae appeared in the lungs before they were found in the intestine. In the lungs the larvae increased in size considerably and showed evidence of an approaching molt, indicating the completion of the third stage. Larvae were recovered from the lungs of experimentally infected guinea pigs at various intervals up to the ninth day following exposure to infection. The available evidence indicates that the larvae migrated from the lungs to the intestine; larvae were found in the intestine 9, 12, and 16 days after experimental infection, but they were absent from the intestine of guinea pigs examined 24 days after exposure to infection or later. The worms recovered from the intestine of guinea pigs were in the fourth stage. They were provided with a provisional buccal cap-

sule, armed with 3 teeth at its base; from 14 to 16 days after experimental infection the worms in the intestine showed unmistakable sex differentiation.

"Marked lesions, ranging from small petechiae to large and striking hemorrhagic areas, were noted in the lungs of guinea pigs examined post mortem within about a week following exposure to infection; the hemorrhagic areas began to fade out during the second week following infection."

Observations on *Trichostrongylus tenuis* infestation in domestic and game birds in the United States. E. B. CRAM and E. CUVILLIER (*Parasitology*, 26 (1934), No. 3, pp. 340-345).—Clinical trichostrongylosis, caused by *T. tenuis* (Mehlis 1846; R. & H. 1909) in the ceca, previously known in epizootic form among gallinaceous birds in Great Britain, is here reported for the first time in the United States in native domestic geese in the District of Columbia and in imported pheasants in Michigan.

Three new trichomonads from birds. B. V. TRAVIS and F. N. HAMERSTROM, JR. (*Iowa State Col. Jour. Sci.*, 8 (1934), No. [4], pp. 537-543, figs. 7).—Contributing from the Iowa Experiment Station, the authors describe two new species of trichomonads from the nighthawk (*Chordeiles minor* Forster) under the names *Trichomonas* (*Tritrichomonas*) *chordeilis* and *Trichomonas* (*Trichomonas*) *iowensis* and one species, *T.* (*Trichomonas*) *pisobiae*, from three species of sandpipers, *Pisobia minutilla* Vieillot, *P. melanotos* Vieillot, and *Ereunetes pusillus* Linn.

A manual of entomological equipment and methods, I. A. PETERSON (*Ann Arbor, Mich.: Edwards Bros.*, 1934, pt. 1, pp. 21+[10]+XIII, pls. 138).—A brief introduction to this work (pp. 1-3) is followed by discussions of a field insectary (pp. 4-9) and the environment within cages and containers (pp. 10-19). Plates are then given illustrating, largely with outline drawings, and describing the various pieces of equipment employed in entomological work and their use. Explanations and references to the literature, where they may be found, or the names of the contributors appear with the plates. Supplementary information is presented in appended tables, and indexes of authors and contributors and subject matter are included.

A second part will deal with various used rearing methods, other investigational technic, and miscellaneous topics.

An entomotograph, an instrument for recording the appendicular or locomotor activity of insects. J. F. YEAGER and R. B. SWAIN (*Iowa State Col. Jour. Sci.*, 8 (1934), No. [4], pp. 519-525, pls. 2).—A description is here given of an instrument called an entomotograph, which was devised for the purpose of recording the appendicular and locomotor activity of larval, nymphal, and adult insects. By calibration the force exerted by the insect can be measured in grams or dynes. "With this instrument it is possible to record graphically the effects on activity of various chemical substances applied to the animal's body. It has been shown that the entomotogram of the normal roach (*P[eriplaneta] americana* L.) (large nymphs and adults) is quite recognizable and reproducible. The marked effects of applying one drop of benzol to the insect's abdominal exoskeleton have been demonstrated. It has been shown that the application of one drop of acetone to the insect's abdominal exoskeleton is without appreciable effect and that, therefore, acetone may be used as a solvent in solutions of certain organic compounds applied in this way. It is suggested that this method may be of use to insect toxicologists, applied entomologists, and other investigators in the field of insect control who are interested in the effects of chemical compounds upon insect activity."

[Contributions on economic insects] (*Conn. Pomol. Soc. Proc.*, 43 (1933), pp. 59-85, 110-114, 208-210).—Contributions here presented (E. S. R., 71, p.

504) relating to economic insects and their control are as follows: Some Important Orchard Insects, by J. A. Evans (pp. 59-69); Resolution concerning Spray Residue Tolerance (pp. 69, 70); Report on Results of Tests with Lead Arsenate Substitutes, by P. Garman (pp. 70-80); Report on Plans for Supplying Peach Moth [Oriental Fruit Moth] Parasites to Connecticut Peach Growers, by P. Garman, J. Lyman, and H. C. C. Miles (pp. 81-83); Report of Committee on Injurious Insects, by W. E. Britton, J. A. Manter, and A. T. Henry (pp. 110-114); and Connecticut Inaugurates a Fruit Pest Control Program (pp. 208-210).

[Contributions on economic insects and their control in Indiana] (*Ind. Hort. Soc. Trans. 1933, pp. 65-78, 95, 96*).—Contributions presented at the annual meeting of the Indiana Horticultural Society at La Fayette in January 1934 include the following: Results of the Codling Moth Studies of 1933 at the Vincennes Laboratory, by R. F. Sazama (pp. 65-69); Past Season's Plot Experiments, by G. E. Marshall (pp. 69-73); results of experiments with the codling moth in southern Indiana in 1933, by R. Dorman (pp. 73-75); Codling Moth Control in 1934 (pp. 75-78) and Screening Packing Sheds for Codling Moth Control (pp. 95, 96), both by J. J. Davis; and Experience with Codling Moth Traps, by C. Clements (p. 96).

[Work with economic insects and rodent control at the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed., pp. 55, 56, 57, 92-103, 113, 114, 123, 124*).—The work of the year referred to (E. S. R., 69, p. 824) includes that with red squill for the destruction of rats; sweetpotato weevil control; the sugarcane root borer (*Diaprepes abbreviatus* L.) and its control, particularly by parasites; ant control; the pink bollworm; the lima bean pod caterpillars (*Maruca testulalis*, lima bean pod borer, and *Fundella cistipennis* Dyar) and their control; introduction of *Trichogramma minutum* from California by airplanes; parasites of the sugarcane mealybug; a coffee leaf miner; the cottony-cushion scale; fruit flies (*Anastrepha* spp.); the banana root borer; miscellaneous cooperative work; and apiculture.

Some insects collected in Mexico, mostly in association with man and animals or animal products, R. A. ROBERTS (*Jour. N. Y. Ent. Soc., 42 (1934), No. 3, pp. 249-262*).—An annotated list of insects and Ixodoidea, presented in connection with tabular information.

[Contributions on economic entomology] (*Ztschr. Angew. Ent., 20 (1933), Nos. 1, pp. 1-161, figs. 55; 2, pp. 169-325, 327, 328, figs. 48; 3, pp. 329-466, figs. 57; 20 (1934), No. 4, pp. 489-645, figs. 47*).—The contributions presented (E. S. R., 69, p. 233) are as follows:

No. 1.—Studies on the Ecology, particularly the Population, of the Nun Moth *Lymantria monacha* L. (The Potential of Increase and the Mortality of the Developmental Stages in Their Relation to Temperature and Atmospheric Moisture), by W. Zwölfer (pp. 1-50); The Influence of Starvation and Close Confinement on the Growth and Reproduction of Lepidoptera, by C. Hofmann (pp. 51-84); The Influence of Environmental Conditions (Temperature and Food) on the Egg Production and Longevity of an Insect (*Sitona lineata* L.) with Post Metabolous Egg Development and Prolonged Oviposition Period, by K. T. Andersen (pp. 85-116); Remarks on the Contribution of Rudolf Geiger: "Meteorological Observations in the Course of Control Work with the Pine Noctuid [*Panolis flammea*] in Middle Franconia through Use of Airplane and Motor Duster in the Year 1931", by F. Borchers (pp. 117-125) (E. S. R., 69, p. 233); Experimental Contribution on the Biology of Mosquitoes—III, The Digestion of Blood and the Maturation of Eggs in *Anopheles maculipennis* at the End of Hibernation, by O. Hecht (pp. 126-135) (E. S. R., 69, p. 234); Investigations of the Size of the Particles of the Active Substance in Aqueous Suspensions of Pyrethrum Insect Powder, by W. Buchmann (pp. 136-149); and

The Method of Survival of Bacteria in the Puparia of the Seed-Corn Maggot (*Hyalemyia ciliatula* Rond.) [in English], by J. G. Leach (pp. 150-161).

No. 2.—The Development of the Pine Noctuid (*Panolis flammea* Schiff.) in 1931 in the Lorenzer State Forest, by B. A. Marcus (pp. 169-203); Comparative Morphology of the Alimentary Canal and Its Appendages in the Lepidoptera, by K. Dauberschmidt (pp. 204-267); A Severe Attack by *Lyda arvensis* Panz., by J. E. V. Boas (pp. 268-280); A Contribution to the Knowledge of the Development of *Haplothrips aculeatus* F., by A. Körting (pp. 281-295); Contributions to the Knowledge of the Biology of *Agriotes lineatus* L. and *A. obscurus* L., II, by R. Langenbuch (pp. 296-306) (E. S. R., 69, p. 233); Braconids and Their Hosts, by J. Fahringer (pp. 307-323); Maggot Infections (*Lucilia sericata*) in Sheep in the Zuider Zee Department, by E. A. R. F. Baudet and O. Nieschulz (pp. 324, 325); and *Chortophila rubicola* n. sp., a Pest of Raspberry Shoots, by G. Enderlein (pp. 327, 328).

No. 3.—Studies of the Ecology of the Pine Spinner (*Dendrolimus pini* L.): The Influence of Temperature and Humidity on Mortality and Period of Development, by T. Kojima (pp. 329-353); Experimental Investigations of the Influence of Temperature and Humidity on the Development of the Gypsy Moth (*Porthetria dispar* L.), by M. Ali (pp. 354-381); Investigations of Fruit-Tree Carbolineums (Tar Distillates), by F. Beran and O. Watzl (pp. 382-414); On the Relation between Population Density and Egg Production of the Females of the Willow Scale (*Chionaspis salicis* L.), by E. Smirnov and N. Wiolovitsh (pp. 415-424); On the Manner of Pupation of Some Parasites of the Pine Noctuid (*Panolis flammea* Schiff.), by R. Kuntze (pp. 425-434); On the Development of an *Aedes* Mosquito Plague in the Summer of 1932 in Swinemünde, by W. Herold (pp. 435-441); Forest Entomology Investigations in the District of Lunz—III, Investigations of the Course of Absolute Humidity in the Cambium Zone of Fallen Trap Trunks, by O. Beran (pp. 442-448) (E. S. R., 67, p. 285); Statistical Investigations of the Head Capsule of Sawflies, by K. E. Schedl (pp. 449-460); Irrigation and Malaria, by S. Konsuloff (pp. 461-463); and *Boarmia bistortata* Goetze as a Primary Enemy of Fir Trees, by S. S. Prossoroff (pp. 463-466).

No. 4.—The Action of Pyrethrum on Forest Pests under the Influence of the Physiological Condition of the Pests and of the Effect of Ecological External Factors, by K. Gösswald (pp. 489-530); A Contribution to the Biology of *Galerucella viburni* Payk., with Particular Regard to Brood Protection and to the Anatomical and Physiological Peculiarities Connected with This Insect, by M. Lühmann (pp. 531-564); Fruit Tree Carbolineum (Tar Distillate) as an Insecticide, by W. Speyer (pp. 565-589); The Question of Vital Optimum Temperature—II, The Temperature Dependence of Individual Physiological Processes and Their Relation to the Vital Optimum of the Organism, by I. W. Kozhantschikow (pp. 590-610); Ichneumonoid Parasites Reared in Recent Years from Pests in Russia, by N. F. Meyer (pp. 611-618); Some Quantitative Relations in Insect Epidemiology, by G. F. Gause (pp. 619-623); A Simple Home-Made Thermohygrostat with Internal Air Circulation, by E. Meyer (pp. 624-635); The Bionomy of *Ectopsocus parvulus* Kolbe, by K. E[scherich] (pp. 636-638); A Brief Contribution to the Knowledge of Wood Pests, by K. Schedl (pp. 638, 639); The Macrofauna of Forest Litter, by A. Ulrich (pp. 640-642); and Notes on *Cochlidion limacodes* Hfn., by K. E[scherich] (pp. 642-645).

[Contributions on economic insects in Chosen (Korea)] (*Chosen Govt. Gen. Agr. Expt. Sta. Jour.*, No. 18 (1931), pp. 69, pls. 4; No. 19 (1933), pp. 48, pls. 7, figs. 11).—The contributions presented in No. 18 are as follows: Biological Studies on the Dermestid Beetle *Trogoderma granarium* Everts (pp. 1-23, Eng. abs. pp. 20-22) and Biological Studies on the Rice Weevil (*Calandra oryzae* Linn.) (pp. 25-69, Eng. abs. pp. 62-65), both by S. Nakayama.

The contributions in No. 19 are Biological Studies of *Diatraea shariinensis* Eguchi, by M. Eguchi (pp. 1-20, Eng. abs. p. 19); Biological Studies of *Anadastus fucosus* Lewis, by S. Nakayama and I. Tabashi (pp. 21-32, Eng. abs. p. 32); and Notes on the Life History and Control Measures of *Phaedon incertum* Baly, by S. Nakayama, J. Masaki, and I. Tabashi (pp. 33-48, Eng. abs. pp. 47, 48).

[Economic insects in South Australia] (Univ. Adelaide, So. Aust., Waite Agr. Res. Inst. Rpt., 1925-32, pp. 54-66, figs. 8).—This contribution presents notes on investigations under way in South Australia. Pests considered include the lucerne flea (*Sminthurus viridis* L.), the red-legged earth mites (*Halotydaeus destructor* Tucker and *Penthaleus bicolor* Froggatt), cockchafer grubs, particularly those of *Aphodius* sp., thrips (*Frankliniella insularis* Franklin) on tomatoes, the apple thrips (*Thrips imaginis* Bagnall), green peach aphid, and blowfly enemies of sheep. The effect of climate and weather on insect abundance is briefly noted.

The annual wheat insect survey, with special reference to the Hessian fly situation, 1934, T. H. PARKS (Ohio Sta. Bimo. Bul. 170 (1934), pp. 171-174, figs. 3).—In this annual survey (E. S. R., 70, p. 61), 350 wheat fields located in 34 counties were examined just previous to harvesting the 1934 wheat crop. The average infestation of the Hessian fly for the entire State was found to be 15.5 percent, as compared with 8.1 percent the preceding year. The fly was found to have increased in 19 counties and decreased in 7 counties.

While the chinch bug, which was encountered during the survey, was present in larger numbers than in many years, it did no great damage to the wheat crop except in certain spots of the heavier populated fields. The wheat midge and the wheat jointworm were found to be very scarce.

Maps are given indicating the percentage of wheat straws infested with the Hessian fly, the Hessian fly-free seeding dates, and the area showing the chinch bug outbreak area of 1934.

[Contributions on forest entomology] (In *Union Internationale des Instituts de Recherches Forestières, Congrès de Nancy, 1932, Comptes Rendus. Nancy: Impr. Berger-Levrault, 1933, pp. 553-569, 721-735*).—The contributions relating to forest insects (E. S. R., 69, p. 234) are Comparative Immunity of Mediterranean Forests as Regards Parasitical Insects, by P. de Peyerimhoff (pp. 553-569, Ger. abs. pp. 567, 568, Eng. abs. pp. 568, 569); The Forests of France Discussed as a Whole from Point of Their Resistance to the Attacks of Insects, by A. Barbey (pp. 721-727, Ger. abs. pp. 723-725, Eng. abs. pp. 725-727); and Problems of Forest Entomology in the Netherlands East Indies, by L. G. E. Kalshoven (pp. 728-735, Ger. abs. p. 734, Fr. abs. pp. 734, 735).

Spray problems, old and new, P. J. PARROTT (N. Y. State Hort. Soc. Proc., 78 (1933), pp. 5-14).—This contribution from the New York State Experiment Station relates particularly to spraying programs for the cherry maggot and codling moth.

Note on experiments made with the object of finding an efficient and economical insecticide spray for the destruction of mosquitoes and flies, E. BABER (Jour. Roy. Army Med. Corps, 62 (1934), No. 6, pp. 411-418).—The author's tests of insecticide sprays, conducted in the Union of South Africa, have shown a high percentage of recoveries in periods of from 3 to 12 hr. and demonstrated the futility of judging the killing power of an insecticide by the number of insects apparently dead after a lapse of 3 hr. or less.

"The efficiency of prepared proprietary insecticides was found to vary considerably. The fixing of some specified biological standard of efficiency for insecticide sprays would appear to be desirable. A simple saturated solution

of naphthalene in paraffin oil was found to provide a moderately effective insecticide spray. Its low cost is an important consideration. Mosquitoes proved to be infinitely more susceptible to the action of insecticide sprays than flies. A higher kill resulted with mosquitoes than with flies even with one-thirtieth the quantity of insecticide spray. Mosquitoes were found to be peculiarly susceptible to the action of insecticides prepared from liquid extract of pyrethrum. Prepared extract of pyrethrum proved to have very high killing powers and to provide a ready means for the preparation of a useful insecticide. The addition of oil of citronella resulted in a definite increase in the killing powers of pyrethrum extracts. A formula which included prepared liquid extract of pyrethrum, oil of citronella, petrol, and paraffin oil was found to provide a very efficient and economical insecticide for the destruction of flies and mosquitoes and gave results superior to all others tested."

Soybean oil meal emulsifies mineral oils, C. O. EDDY (*Ky. State Hort. Soc. Trans.*, 1933, pp. 139-141).—Contributing from the Kentucky Experiment Station the author reports that laboratory work conducted during the dormant season of 1932-33 indicated the possible value of soybean oil meal as an emulsifier for mineral oils for dormant spray purposes. This led to a cooperative experiment at Henderson in which soybean oil meal was used in making tank-mixed emulsions. No injury was caused, and the results appear to be quite as satisfactory as the tank-mixed emulsions made with calcium caseinate. An improvement is said to have been made in the method of preparing soybean oil meal for emulsification purposes, with a saving in expense of approximately 15 percent instead of the 10 percent of the 1932-33 season. The soybean oil meal is said to be proving satisfactory in both the tank-mixed emulsions and in the making of stock solutions which contain 83 percent oil. Preliminary freezing tests failed to break or injure the 83 percent stock emulsions in any way. It is pointed out that about 10 percent of caustic potash is needed with the soybean oil meal since it is very nearly neutral.

"Soybean oil meal may be prepared for emulsification purposes by cooking 1 part meal with about 150 parts of water until all of the meal is in a perfectly smooth condition, after which about 10 percent caustic potash (based on weight of soybean meal) should be added with constant stirring. After this procedure the meal used in the experiments mentioned was in the condition of a jelly. It is necessary to use about 10 percent of this soybean jelly to make an 83 percent oil emulsion."

The soybean oil meal used in these experiments is said to have analyzed protein 66.8 percent, fat 2.7, ash 2.7, moisture 8.6, and nitrogen-free extract 19.2 percent.

Investigations of sulfur dust for citrus thrips and certain scales, E. A. MCGREGOR (*Calif. Citrogr.*, 19 (1934), No. 9, pp. 232, 254-256, figs. 9).—In 1932 the author arranged for the manufacture of sulfur dusts of three degrees of fineness—a coarse dust, a standard dust, and a dust of special fineness, passing 65, 90.1, and 95.8 percent, respectively, through a 325-mesh screen. Extensive counts at picking time of oranges grown on 2 test plats which received 3 applications of these sulfur dusts revealed a strong correlation between fineness and effectiveness against thrips injury, the finest dust being most effective. These results were duplicated in similar experiments in 1933.

Since the thrips were not generally seriously abundant in southern California in 1933, attention was directed chiefly to a study of the effect of sulfuring against citrus scales. The results of the work of that year in 11 citrus districts in the southern part of the State extending from Redlands to West On-

tario, reported upon in tabular form, include the details of citricola, black, and yellow scale counts of 38 sulfur-dusted orchards, 1 lime-sulfur-sprayed orchard, and 3 untreated orchards applied largely during October or earlier. The final counts of live young scales in the sulfured groves range from none to 8.3 per unit. The average number of live young scales (lumping together citricola and black scales) in 38 orchards dusted with sulfur in 1933 was 0.98 per unit. It is pointed out that "dusting is most effective in the hotter, inland districts, and there is no evidence at present to indicate that sulfurizing possesses any economic possibilities in the strictly coastal districts. Since sulfur seems to have little effect on the red scale, a program of sulfur dusting without adequate measures to combat this insect might permit excessive infestation of the red scale to build up in certain districts. The factor of sulfur burn is a hazard that makes the full dusting schedule for the black scale a somewhat risky one because of the high temperatures that might occur in connection with sulfurings during June, July, and August. In the case of lemons, also, dusting is attended with risk of burn, especially during the summer months, and particularly in orchards subdivided by windbreaks. Where an orchard is surrounded by tree hedges, the air circulation is reduced, and the sulfur gas concentration becomes relatively high and active."

Effect of arsenical and copper insecticides on the natural control of white-flies and scale insects by fungi on orange trees in Florida, S. B. HILL, JR., W. W. YOTHERS, and R. L. MILLER (*Fla. Ent.*, 18 (1934), No. 1, pp. 1-4).—It was found in work in Florida that "lead arsenate, cryolite, and potassium aluminum fluoride allowed white flies to increase on orange trees at Orlando so that after 8 mo. the infestation was from 1.5 to 5 times as great as on untreated checks, while copper compounds allowed white flies to increase to an infestation from 5 to 10 times as great as on the checks. Unsprayed groves at Orlando may have a natural fungus control of the white fly as high as 90 percent, but when groves are sprayed with any mixture containing a copper compound, such as Bordeaux mixture, only about 40 or 50 percent of natural control can be expected. Copper compounds used on orange trees at Orlando allowed the purple scale to increase to a population nearly twice as great as that on untreated checks. Lead arsenate, cryolite, and potassium aluminum fluoride had no measurable effect on the amount of scale fungus or on the live scale population. Bordeaux mixture was the most serious in allowing scale to increase, and copper carbonate followed closely. A natural control of about 60 percent in unsprayed groves can be expected, but when the groves are sprayed with Bordeaux mixture only about 20 percent control can be expected."

An automatic distributing machine for paris green mixtures, P. F. RUSSELL and L. S. EATON (*Philippine Jour. Sci.*, 53 (1934), No. 4, pp. 497-503, pls. 2, figs. 2).—Diagrams and descriptions are given of an automatic distributing machine for paris green mixtures devised by the authors. This powder distributor is motivated by the current of the stream in which the larvicide is to be distributed. It is considered to be a low-priced and effective mechanism, which in some places materially reduces the cost of malaria prophylaxis.

The "lucerne flea" *Smynturus viridis* L. (Collembola) in Australia, J. DAVIDSON (*Aust. Council Sci. and Indus. Res. Bul.* 79 (1934), pp. 66, pls. 5, figs. 28).—This account (*E. S. R.*, 70, p. 652) is presented in connection with a list of 45 references to the literature.

The "lucerne flea" problem in South Australia, J. DAVIDSON (*So. Aust. Dept. Agr. Bul.* 286 (1933), pp. 7, figs. 3).—This contribution relates to the most serious pest of clover and lucerne pastures with which the South Australian

farmer has to contend. In favorable, wet seasons it may be also troublesome on other crops.

Redescriptions of North American Sminthuridae, J. W. FOLSOM (*Iowa State Col. Jour. Sci.*, 8 (1934), No. [4], pp. 461-511, figs. 151).—The author here redescribes 19 species representing the genera *Sminthurinus*, *Bourletiella*, *Sminthurus*, *Dicyrtomina*, and *Ptenothrix*, 15 of which have been redescribed and figured from cotypes. A list is given of 65 references to the literature.

The bdellid mite *Biscirus lapidarius* Kramer, predatory on the lucerne flea *Sminthurus viridis* L. in Western Australia, G. A. CURRIE (*Jour. Council Sci. and Indus. Res. [Aust.]*, 7 (1934), No. 1, pp. 9-20, figs. 3).—In a survey made of the agricultural areas of Western Australia to ascertain the status of the bdellid mite *B. lapidarius*, previously reported by Womersley (*E. S. R.*, 68, p. 500) as an enemy of the lucerne flea (*S. viridis*), evidence was found in support of the claim that in certain cases it does control that pest.

"A method of collecting mites in large numbers was devised and a technic developed for transporting them alive over great distances. Over 13,600 mites were collected and sent as experimental colonies to various points in Western Australia, South Australia, Victoria, and Tasmania. Some statistical data showing the effect of the mite attack on the numbers of fleas were obtained and are represented graphically. The problem of whether the mite is an indigenous or an introduced species is considered. The type of control exercised by the mite is discussed. Suggestions are made for the direction of future work."

Non-arsenical stomach poisons for grasshopper control, W. L. THOMPSON (*Fla. Ent.*, 18 (1934), No. 1, pp. 5-10).—The details of control work with grasshoppers in Florida through the use of dusts, sprays, and baits are presented in tabular form. While grasshoppers are not as a rule a serious pest of citrus trees over 3 or 4 yr. of age, they caused severe damage during the fall of 1931 in some orange groves in the central part of the State, the American grasshopper causing the most damage.

Out of 200 grasshoppers that were not exposed to poison, only 6 tachinid parasites were observed.

"Sodium fluoride and Kalo gave the best results and were the most economical. Both of these materials compare with the kill obtained by using paris green bran bait in like amounts. No burning of foliage was observed when sodium fluoride or Kalo were used in the bran bait, which was thrown on the plants. Copper carbonate gave only fair results unless used in rather large amounts."

The gladiolus thrips (*Taeniothrips gladioli* M. & S.), E. A. HERR (*Ohio Sta. Bul.* 537 (1934), pp. 64, figs. 12).—This is a summary of information, presented in connection with a list of 26 references to the literature, on the history, morphology, economic importance, and control of the gladiolus thrips, the details being given in 33 tables. This thrips appeared simultaneously in Ohio and in Ontario, Canada, in 1929 and has since become widely distributed in North America and the most serious pest of gladiolus.

"Every part of the plant except the cormel or bulblet is subject to attack; the flower spike suffers the greatest injury, and the loss in cut flowers alone may amount to from \$1,500 to \$3,000 per acre. In addition, the loss due to injured corms and stunted corm growth are items of no small moment to the grower. . . .

"Parthenogenesis in this species of thrips may occur, and the progeny in all such cases noted were males. Because of the polygamous habits of the males, it is probable that very few unfertilized females occur normally. Hibernation in Ohio occurs largely, if not entirely, on the corms in storage. No insects were

observed to survive the winter out-of-doors. The development of all stages of the gladiolus thrips on corms in storage was accelerated with an increase in temperature. The developmental period of all stages for five different temperature levels is given. The developmental period of the various stages in the field is similar to those reported by Smith and Nelson [E. S. R., 69, p. 688]. During the period from June 10 to October 15, 1932, nine generations were reared in the insectary at Wooster, Ohio. Additional generations may have developed in the field before June 10.

"Both adult and nymphal stages are secretive in habit and quite sluggish in movement in comparison with some other species of thrips. Considerable migration occurs, however, under heavy infestation conditions. Natural infestations of gladiolus thrips have been found on Japanese and German iris, calla lily, montbretia, torchlily, and tigerflower. It has been taken on many other flowers and plants both in the field and the greenhouse.

"Only one natural enemy was observed and this is not significant. Heavy rains, however, perceptibly reduce thrips population on growing plants. Resistance and susceptibility to thrips attack were demonstrated among gladiolus varieties. Proper methods of harvesting corms in infested plantings aid materially in the control of this pest. Proper methods of storage where low temperatures are maintained prevent injury to the corms. From the standpoint of the small grower, an outdoor pit storage offers promise. Thorough treatment of the corms in storage with naphthalene flakes, ethylene dichloride (3 parts)-carbon tetrachloride (1 part), and with calcium cyanide will insure clean corms. The most favorable results were obtained by treating the corms in small lots before they were placed in storage in the fall. If treatment is delayed until spring, the insecticidal dips, mercuric chloride (corrosive sublimate) and Semesan, should be used. Other fungicidal dips, such as Calogreen and calomel, did not give 100 percent control when used as recommended for the control of diseases. None of the corm treatments which are recommended showed any ill effect on subsequent corm development if the corms were dormant when the treatment was applied. The outstanding field treatment is a weekly application of a spray consisting of paris green (0.5 lb.) and brown sugar (33½ lb.) to 50 gal. of spray. Slight burning occurred when paris green was used at the rate of 0.5 lb. to 50 gal., but burning was severe when 1 lb. was used. Some varieties of gladiolus are more susceptible to spray injury than others."

Banana thrips and the problem of its control, J. H. SMITH (*Queensland Agr. Jour.*, 40 (1933), No. 6, pp. 508-524; 41 (1934), No. 1, pp. 5-29, figs. 3).—This is an account of *Scirtothrips signipennis* Bagn., which causes rust of the banana through its feeding on the surface of the fruit.

Grass thrips attacking tobacco plants (*Anaphothrips obscurus* Müll), G. E. COGHLAN and R. T. M. PEScott (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 7, pp. 357-359, figs. 4).—An account is given of the so-called grass thrips *A. obscurus*, which assumed economic importance in Victoria in 1933-34 for the first time for its damage to the leaves of tobacco. It has previously been known to occur in Victoria, having appeared annually on the seedlings in the seed beds, causing a certain amount of weakening of the young plants.

Thrips investigation, II, III (*Jour. Council Sci. and Indus. Res. [Aust.]*, 7 (1934), No. 2, pp. 61-69, figs. 2; 70-72).—In the second contribution (E. S. R., 70, p. 209), Some Factors That Regulate the Abundance of *Thrips imaginis* Bagnall, by J. W. Evans, particular attention is paid to rainfall as a factor limiting thrips abundance. The third contribution, Some Observations on the Loss of Toxicity of Certain Dusts Used in Experiments on the Control of the

Apple Thrips (*T. imaginis* Bagnall), by H. W. Wheeler, reports on some preliminary experiments that have been made with pyrethrum and derris exposed for different periods in order to determine their toxicity against *T. imaginis* and the relation between toxicity and chemical composition.

Studies of derris, nicotine, paris green, and other poisons in combination with molasses in the control of the gladiolus thrips, H. H. RICHARDSON (*Jour. Agr. Res. [U. S.], 49 (1934), No. 4, pp. 359-373, figs. 4*).—This contribution reports upon investigations commenced and carried out in 1932-33 under laboratory and greenhouse conditions. The deposits left by combination sprays of molasses solution with derris extract, or paris green, or hellebore powder were all toxic to the gladiolus thrips. Derris-molasses deposits retained toxicity much longer when exposed to sunlight than derris alone or in combination with soap or sulfonated castor oil. Derris extract-soap deposits deteriorated exceptionally fast. Derris-molasses spray gave commercial control of *Thrips nigropilosus* Uzel on *Cineraria*, but was ineffective against the onion thrips on onion. Derris-sulfonated castor oil was effective against the onion thrips on onion and also against the red spider mite *Tetranychus bimaculatus* Harvey on roses and other plants. Paris green is much more soluble in molasses than in brown sugar solution, and the former combination appeared promising as a substitute for the latter spray. Nicotine sulfate-molasses deposit remained toxic for a much longer time than other nicotine sprays, but was not sufficiently effective against older larvae and adults to give good control. Pyrethrum extract-molasses deposits had little toxicity. Results with tartar emetic, borax, calcium arsenate, lead arsenate, and copper sulfate are also reported. The toxicity and stability of a spray deposit are important factors in thrips control.

The green stinkbug, G. W. UNDERHILL (*Virginia Sta. Bul. 294 (1934), pp. 26, figs. 10*).—Studies of the life history, habits, natural enemies, and control measures are presented, the details being given in six tables.

This pest has been found in some 20 counties of Virginia, where it feeds and develops (E. S. R., 69, p. 689) on 52 or more wild and cultivated plants, bean pods and peach fruits being the principal crops injured. When found on beans, it is always accompanied by a disease, the cause of which [*Nematospora phaseoli*] is inoculated into the growing bean as the insect feeds. Because of the presence of this disease, a few bugs frequently cause injury out of proportion to their number.

"There is only one brood of the insect during the season. The winter is passed in the adult stage under leaves and trash in the woods. The adults appear about the middle of June at Richmond. The overwintered bugs are most numerous in the latter part of June and throughout July, the majority dying by the middle of August. . . . Egg laying begins about the middle of June or the last week in June, and usually most of the eggs are deposited during the first and second weeks of July. The eggs are generally pea green in color but may be yellow, and are laid in clusters averaging about 36 in number. A female deposits 75 to 80 eggs. The eggs change to a rose pink color in about 3 days and hatch in about 8 days. The first nymphs hatch out about the last week in June and are present in the field until the middle of November. They molt 5 times. The length of the first to fourth instar ranges from 5 to 7 days, and the fifth is about 2 weeks. The total development period from egg to adult averages a little over 5 weeks. The new brood adults are reaching maturity from the last week in July until November. They enter hibernation mainly in September and October.

"The green stinkbug has many natural enemies, among which are several species of common birds. This insect is also preyed upon by predacious and parasitic insects. A tachinid fly attacks the older nymphs and adults, while the egg parasites, of which 6 species have been recorded, very effectively destroy the eggs. In these studies from 16 to 27 percent of the eggs have been found to be parasitized. No parasitic fungi have been observed attacking the stinkbug during these studies.

"Numerous tests were made with all of the available contact sprays to determine their effectiveness against the nymphs. Some experiments were also made by applying sprays to the eggs and to the adults. All stages of the insect are very resistant to insecticides, but the nymphs can be killed by using strong solutions of soap or mixtures of sprays containing soap and pyrethrum, or soap and rotenone. None of the combinations proved effective against the adults and eggs."

Studies of this pest in Ohio by Whitmarsh have been noted (E. S. R., 37, p. 258).

Biology of *Euschistus variolarius* P. De B. (Family Pentatomidae; Order Hemiptera), H. E. PARISH (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 1, pp. 50-54).—Notes are presented on the distribution, hibernation, influence of temperature on activity, duration of the incubation and nymphal stages, host plants, and detailed descriptions of the various stages, together with a list of dipterous parasites reared from adult *E. variolarius*.

Three tachinids, namely, *Trichopoda pennipes* Fab., *Gymnosoma fuliginosa* Desv., and *Cistogaster immaculata* Macq., were reared from overwintering adults of *E. variolarius* at Ames, Iowa. Of the above species, *T. pennipes* is the most important, parasitizing 3.8 percent of the adults collected in the spring of 1929.

Tingitoidea affecting cotton, F. A. FENTON (*Canad. Ent.*, 66 (1934), No. 9, pp. 198, 199).—This is a contribution from the U. S. D. A. Bureau of Entomology and the Texas Experiment Station, cooperating. The species identified as *Gargaphia iridescens* Champion was found to be the cause of a peculiar leaf injury to young cotton plants at Presidio, Tex., in May 1933. It has also been recorded as collected at several other points in Texas and in New Mexico, Arizona, Colorado, California, and Mexico. An annotated list is given of eight other species of Tingitoidea said to have been recorded as feeding on cotton in the New World.

Notes on the biology of *Acantholoma denticulata* Stal. (Hemiptera, Scutelleridae), H. M. HARRIS and F. ANDRE (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 1, pp. 5-15, pls. 2).—These notes relate to a scutellerid beetle that feeds on the flower heads of the native perennial plants *Ceanothus pubescens* and *C. ovatus* in the vicinity of Ames, Iowa.

Chrysanthemum lace-bug (*Corythucha marmorata*), E. I. McDANIEL (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 1, pp. 23, 24, fig. 1).—A brief practical account is given of *C. marmorata*, which occurs throughout the United States, breeding freely on weeds of the family Compositae, from which it migrates into cultivated areas and attacks garden flowers. Of its native host plants it seems to prefer wild aster, goldenrod, and ragweed, while on cultivated plants it is most destructive to aster, chrysanthemum, dahlia, and *Scabiosa*. There are several annual generations. The infested foliage usually is spotted with pellets of waste material, and when the insects are present in large numbers the foliage dries up rapidly.

The insect is readily controlled by contact sprays or dusts in both the adult and nymphal stages.

The mango hoppers and their control in the Konkan, Bombay Presidency, P. V. WAGLE (*Agr. and Livestock in India*, 4 (1934), No. 2, pp. 176-188, pls. 2).—This contribution relates to the biology and control of three species of mango hoppers, *Idiocerus niveosparsus* Leth., *I. atkinsoni* Leth., and *I. clypealis* Leth., of which the last mentioned is the most important. They attack the inflorescence and young fruits, which wither away. The damage is said to be estimated at 60 percent in certain years. The life history of these hoppers under the Konkan conditions is nearly the same for all the three species and extends over a period of from 15 to 19 days.

Insect parasites of Psyllidae, K. B. LAL (*Parasitology*, 26 (1934), No. 3, pp. 325-334, figs. 4).—This contribution, which supplements that of Waterston previously noted (E. S. R., 48, p. 753), gives tables with the parasites attacking nymphs and adults and the hyperparasites attacking primary encyrtid parasites. Notes on the parasite *Prinomitius mitratus* and the hyperparasite *Lygocerius semiramusus* Kieff. and the biology of *Endopsylla* n. sp. are included.

Psyllid yellows of potatoes, with a preliminary report on the control of the insect Paratrioza cockerelli Sulc., G. M. LIST and L. B. DANIELS (*Jour. Colo.-Wyo. Acad. Sci.*, 1 (1934), No. 6, pp. 74, 75).—This contribution from the Colorado Experiment Station is based upon the work previously noted (E. S. R., 71, p. 221).

The green peach aphid (*Myzus persicae* Sulzer) in relation to the peach in Victoria, and the measures investigated for its control, I-III, K. M. WARD (*Jour. Dept. Agr. Victoria*, 32 (1934), Nos. 2, pp. 97-104, figs. 6; 3, pp. 134-145, figs. 8; 5, pp. 258-268, figs. 7).—Part 1 of this contribution deals with the economic importance and life history studies conducted from 1930 to 1933; part 2 with the metamorphosis and reproduction of the green peach aphid including descriptions of the principal forms, the forecasting of general outbreaks, and parasites and predators; and part 3 takes up control measures. A list is given of the several species of parasites and predators observed to be associated with this pest, the most important enemy of the peach in Victoria. Laboratory tests with various ovidical spray materials show that a tar distillate wash prepared according to the Long Ashton formula is most effective, although lime-sulfur also is highly toxic.

Reproduction in mealybugs, A. J. BASINGER (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 1, pp. 17-20).—The data obtained in studies conducted at the California Citrus Experiment Station show *Pseudococcus gahani* and *Phenacoccus gossypii* to be nonparthenogenetic and to have sex ratios approximating 0.5.

Queensland citrus scale insects and their control, W. A. T. SUMMERVILLE (*Queensland Agr. Jour.*, 41 (1934), Nos. 5, pp. 450-486, pls. 7; 6, pp. 568-591, pls. 6; 42 (1934), Nos. 1, pp. 4-33; 2, pp. 186-207).—This is an extended account of the biology of the coccid enemies of citrus in Queensland, their natural enemies, and control measures.

Contributions towards the knowledge of the red scale (*Chrysomphalus aurantii* Mask.) in Palestine, F. S. BODENHEIMER (*Hadar*, 7 (1934), No. 6, pp. 139-148, figs. 4).—This is a detailed report of studies of the biology of the California red scale, the details of which are presented in table and chart form.

Effect of temperature and humidity on fumigation for red scale, H. J. QUAYLE (*Calif. Citrogr.*, 19 (1934), No. 10, p. 264).—Contributing from the California Citrus Experiment Station, a preliminary report is made of studies of temperature and of humidity in hydrocyanic acid fumigation for the California red scale.

In the first series of experiments, in which the red scale on lemons was fumigated at different temperatures (the fruits having been brought from

ordinary room temperatures), there was no significant difference between a temperature range of 50° and 90° F. With infested lemons that had been preconditioned for from 4 to 48 hr. at 50°, 75°, and 90°, with a relative humidity in each case of 70°, there was a higher percentage of scales killed when preconditioned at 50° than at 75° or 90°, and in every case there was a higher percentage killed when preconditioned at 75° than at 90°. The increase of percentage of scales killed where the insects were preconditioned at 50° as compared with 90° ranged in the different series from 2.3 to 18 percent. There was no difference in the fumigation results where the scales had been preconditioned at 35° as compared with those at 50°.

No significant difference was shown in the number of scales killed when the humidity ranged from 50 to 59 percent as compared to 80 or 89 percent, the temperature in either case being 65°. As between the extremes of humidity, however, there seemed to be a consistent difference in the fumigation results. These extremes of humidity were represented as from 22 to 50 percent as compared with from 90 to 100 percent. With excessive humidity there was a decrease in the number of scales killed.

Spray-fumigation treatment for resistant red scale on lemons, H. J. QUAYLE and W. EBELING (*California Sta. Bul.* 583 (1934), pp. 22, figs. 15).—Experiments conducted with a view to comparing accurately the results of the spray-fumigation treatment with those obtained by spraying alone and by two fumigations are reported. Data on the advantage or disadvantage of applying the spray first; the most satisfactory interval between treatments; the best kind of spray to use; the relation of spray coverage to fumigation results; the most satisfactory interval for two fumigations; and the effect of the spray-fumigation treatment on the tree and fruit, and its relation to the general program of pest control on lemon trees are included.

The work is based upon experiments in 13 lemon groves in Los Angeles and Orange Counties, selected because of the heavy infestation with the California red scale. "There were 6 different plats of from 25 to 30 trees in each grove. Six different spray treatments were applied, each of which was followed by fumigation of two different dosages at intervals of from 4 days to 8 mo. The insect mortality was determined in all cases before treatment and extensive counts made as to the results following the treatment. The average results of all of the different sprays in all of the groves ranged from 72.8 to 91.9 percent of the scales killed on the branches and from 91.6 to 97.5 percent of the scales killed on the fruit. The range in spray-fumigation results in the different groves and at all intervals and dosages was from 99.63 to 100 percent of the scales killed on the branches and from 98.86 to 100 percent of the scales killed on the fruit. The range in results in the two groves where fumigation alone was employed was, for a single fumigation, from 97.18 to 100 percent of the scales killed on the branches and from 91.0 to 100 percent on the fruit. The results of two fumigations ranged from 99.42 percent to 100 percent of the scales killed on the branches and from 97.35 to 100 percent on the fruit.

"The figures given for the spray-fumigation treatment, and also for the two fumigations, represent high insecticidal efficiency. A high percentage of efficiency may be misleading to the grower whose criterion of effective treatment is a reasonably clean grove for at least 1 yr. If there is a high population of the red scale to start with, 99 percent control is scarcely sufficient. If 99 percent control can be obtained, however, even severe infestations can be reduced by repeated treatments. Once the population is low, satisfactory control can be maintained. In much of the citrus area spraying is necessary anyway for the red

spider; hence, the cost of the spray-fumigation treatment should not be chargeable to the red scale alone, since it practically completes the annual pest-control program for lemons."

Inflammation in the caterpillars of Lepidoptera, G. R. CAMERON (*Jour. Path. and Bact.*, 38 (1934), No. 3, pp. 441-466, pls. 2, figs. 2).—The author has found that "caterpillars possess an effective phagocytic mechanism composed of (1) the blood cells, of which there are three main types, (a) lymphocytes, (b) leucocytes, [and] (c) spherule cells; (2) the pericardial cells; [and] (3) certain cells in the fat body. Of these the blood cells are the most active, taking up foreign particles, cells, and bacteria soon after they are introduced into the body cavity. Both lymphocytes and leucocytes are actively phagocytic; the spherule cells as a rule are not. The proportion of lymphocytes rapidly increases during the period of phagocytosis but returns to normal by the time the foreign substance has been removed from the circulating blood."

Relation of the virus and the inclusion bodies of silkworm "jaundice", R. W. GLASER and C. W. LACAILLADE, JR. (*Amer. Jour. Hyg.*, 20 (1934), No. 2, pp. 454-464).—It was found that when blood containing polyhedral bodies was freshly drawn from affected silkworms and immediately centrifuged, the supernatant fluid freed from the inclusions was highly active. "If infectious blood was permitted to stand for some time, the inclusion bodies settled and in the upper layer of the fluid which was free from them no virus was found. The polyhedra continuously lost virus when washed in water, but could not be freed from the infective agent in this manner. A similar result was obtained when the reaction of the wash water was purposely varied. The results with the wash waters could not have been due to a high dilution of traces of the original infectious blood. Though diseased blood was infectious occasionally when diluted 10^{-11} times, it lost its activity at 10^{-12} ."

"The polyhedra could not be freed of virus by the use of certain chemical agents. Heat, however, was effective in rendering inactive the virus associated with them. When they were now brought in contact with active polyhedra-free blood, some of the virus became associated with them."

"The inclusions are evidently physical carriers of the virus, but the experiments do not lend support to the view that they are etiologically important in the sense of a genetic relationship."

An account of the eastern hemlock looper, *Ellopiia fiscellaria* Gn., on hemlock, with notes on allied species, J. J. DE GRUYSE and K. SCHEDL (*Sci. Agr.*, 14 (1934), No. 10, pp. 523-539, pl. 1, figs. 3; *Fr. abs.*, p. 539).—The results of a study made during the summers of 1928 and 1929 of an outbreak of the hemlock spanworm in the region of the Muskoka lakes in the Province of Ontario, Canada, are reported. Predators appeared to be of minor importance in checking the infestation in that region. Four dipterous parasites and 8 species of Hymenoptera were found to attack this spanworm. Of 800 specimens examined in 1928, 20.12 percent were found parasitized—8.25 percent by Diptera and 11.75 percent by Hymenoptera.

Earlier records of infestation, its bionomics, and control are considered.

The codling moth (*Carpocapsa pomonella* L.), R. T. M. PEScott (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 7, pp. 347-352, figs. 6).—The author recommends for Victoria that 2 or 3 sprayings of a recognized white oil emulsion, 1 in 60, be incorporated in the spray programs for codling moth, to follow the initial sprayings with arsenate of lead.

Studies on *Platyedra gossypiella* Saunders, the pink bollworm of cotton, in the Punjab.—Part III, Phototropic response of *P. gossypiella*, M. AFZAL HUSAIN, M. HAROON KHAN, and G. RAM (*Indian Jour. Agr. Sci.*, 4 (1934),

No. 2, pp. 261-289, figs. 4).—This third part (E. S. R., 65, p. 655) deals with the phototropic response of the pink bollworm.

Low-cost method of fighting a major corn pest, R. C. BURDETTE (*Canning Age*, 15 (1934), No. 9, pp. 399, 400, 424, fig. 1).—In a note to this account of control work conducted by the New Jersey Experiment Stations with the corn ear worm based upon work previously noted (E. S. R., 71, p. 75), it is announced that ground pyrethrum flowers soaked in water added to the tartar emetic syringe spray has given striking results when used in cloth cages. There is said to be some recovery of the moths that feed and drop within 15 to 20 min. from the effect of the pyrethrum when this insecticide is used alone. No egg laying was observed in the cages by moths that had fed on the pyrethrum syringe spray.

Derris and pyrethrum dusts for control of cabbage and cauliflower worms, S. C. MCCAMPELL (*Jour. Colo.-Wyo. Acad. Sci.*, 1 (1934), No. 6, p. 73).—The author reports that derris and pyrethrum dusts have been used successfully against the imported cabbage worm, the cabbage looper, and the diamondback moth.

Macrolepidoptera and their parasites reared from field collections in the northeastern part of the United States, J. V. SCHAFFNER, JR., and C. L. GRISWOLD (*U. S. Dept. Agr., Misc. Pub.* 188 (1934), pp. 160).—This contribution consists of a résumé of the data obtained during the course of studies of the enemies of the gypsy moth and brown-tail moth from 1915 to 1929, inclusive. Following a brief introductory account, a host-parasite list is given (pp. 5-106), for each of which hosts is included its (1) food plants, (2) occurrence, (3) total number examined, (4) periods in which the larvae, pupae, and adults occur, and (5) tabular lists of its parasites, with the number reared, the number of years each species of parasite has been recovered, number of collections, and number of larvae reared. A parasite-host list, with details regarding each of the parasites, both Diptera and Hymenoptera, including its host, locality, adult period, number per host, generations, and method of hibernation, follows (pp. 106-155). An index to the genera and species is included.

The families and genera of North American Diptera, C. H. CURRAN (*New York: Author*, 1934, pp. 512, pls. 2, figs. 244).—An introductory discussion is followed by tables for the separation of families and descriptive accounts thereof which include keys to the genera. Many of the illustrations are said to have been reproduced from cuts used in the *Manual of Diptera* (third edition), by S. W. Williston (E. S. R., 21, p. 760). A glossary of terms used in dipterology, references to the literature, and an index are included.

New Jersey Mosquito Extermination Association, twenty-first annual meeting (*N. J. Mosquito Extermin. Assoc. Proc.*, 21 (1934), pp. 155+[3], pls. 8).—This report of the annual meeting (E. S. R., 70, p. 213) includes the following contributions: Mosquito Work in New Jersey for the Year 1933, by T. J. Headlee (pp. 8-37); Resume of Mosquito Work Throughout the World in 1933, by F. C. Bishopp and C. N. Smith (pp. 37-67); The Club Women's Interest in Mosquito Prevention, by H. E. Marsh (pp. 67-69); Mosquito Work of the Civil Works Administration Throughout the Country, by L. W. Smith (pp. 69-75); the results of mosquito control work by several authors in several counties of New Jersey (pp. 75-96), in Florida by M. V. King (pp. 96-100), in Alabama and Mississippi by G. H. Bradley (pp. 100-102), in Canada by A. Gibson (pp. 102-112), in Connecticut by R. C. Botsford (pp. 112-114), in Massachusetts by E. Wright (pp. 114-118), in Long Island by A. D. Jaques (pp. 118-121), and in Delaware by L. A. Stearns and D. MacCreary (pp. 128-136); Mosquito Larvicides, by J. M. Ginsburg (pp. 121-128); A New Develop-

ment in Mosquito Traps, by T. D. Mulhern (pp. 137-140); Public Education in Mosquito Work, by H. N. Prickitt (pp. 140-142); The Habits of Shellfish of New Jersey Waters Adjacent to the Salt Marshes, by T. C. Nelson (pp. 149-153); and Relation of Mosquito Control to Other Shore Interests of New Jersey, by R. F. Engle (pp. 153-155).

Predators of the Culicidae (mosquitoes), I, II, E. H. HINMAN (*Jour. Trop. Med. and Hyg.* [London], 37 (1934), Nos. 9, pp. 129-134; 10, pp. 145-150).—The first part of this contribution deals with the predators of larvae and pupae, exclusive of fish; the second part with the predators of adult mosquitoes, in connection with a three-page list of references to the literature.

The robber flies of Texas (Diptera, Asilidae), S. W. BROMLEY (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 1, pp. 74-113, pls. 2).—Contributing from the Texas Experiment Station, the author records 161 species of Asilidae from Texas, of which 18 are described as new. Two genera (*Promachina*, *Proctacanthella*) are erected. Keys to the subfamilies, tribes, genera, and species are included.

The ox warble fly, S. K. SEN (*Agr. and Livestock in India*, 4 (1934), No. 2, pp. 189-196, pls. 3).—In this discussion of the warble fly it is stated that of the three well-known species, *Hypoderma lineatum*, *H. crossi*, and *H. bovis*, only the first two are definitely known to occur in India.

The tachinid parasites of woodlice, W. R. THOMPSON (*Parasitology*, 26 (1934), No. 3, pp. 378-448, pls. 8, figs. 5).—This contribution from the Imperial Institute of Entomology reports upon a study of the larval morphology and biology of dipterous parasites of the terrestrial isopods or wood lice.

"Porcellio scaber L., *Oniscus asellus* L., *Metaparonorthus pruinosis* Brandt., and *Armadillidium vulgare* Lat., were found to be attacked by one or more of the parasites.

"Seven dipterous parasites have been reared and identified from wood lice: *Plesina maculata* Fall., *Melanophora roralis* L., *Phyto melanocephala* Meig., *Styloneuria discrepans* Pand., *Frauenfeldia rubricosa* Meig., *Cyrrillia angustifrons* Rond., and *Rhinophora lepida* Meig. The biology and larval forms of all of these except *R. lepida* are described and figured, together with those of two undetermined species, 'A' and 'B'."

Field observations on weather stain and blowfly strike of sheep, with special reference to body strike, F. G. HOLDAWAY and C. R. MULHEARN (*Aust. Council Sci. and Indus. Res. Pam.* 48 (1934), pp. 35, figs. 7).—The authors found in field observations in New South Wales that bacterial conditions of wool, known collectively as "weather stain", may be the forerunner of fly attack in the wool on parts of the body other than in the breech, on the prepuce, on the head, or on wounds. Following a discussion of field observations and of rainfall prior to the observations, weather stain and body strike, the relation of weather stain and body strike to (1) yolk color and (2) wool density, and the relation between susceptibility to weather stain and body strike and susceptibility to crutch strike are considered. A list is given of 20 references to the literature, and the details are presented in 13 appended tables.

Studies on the influence of the environment on the sheep blow-fly *Lucilia sericata* Meig.—I, The influence of humidity and temperature on the egg, A. C. EVANS (*Parasitology*, 26 (1934), No. 3, pp. 366-377, figs. 8).—In this contribution many factors governing loss of water from the egg of *L. sericata* are discussed, the loss of water having been found to be the probable cause of mortality and failure to complete development at different combinations of temperature and humidity.

Experimental studies on the biology of *Lucilia bufonivora* [trans. title], E. BRUMPT (*Ann. Parasitol. Humaine et Compar.*, 12 (1934), No. 2, pp. 81-97,

figs. 6).—This contribution (E. S. R., 70, p. 811), presented in connection with a list of 51 references to the literature, brings together the results of observations and reports for the first time on the complete life cycle of a dipterous parasite of amphibians. The author has found *L. bufonivora* to be a parasite closely restricted in its host relations, oviposition having constantly taken place on *Bufo vulgaris* and *Alytes obstetricans*. A single oviposition on *Rana esculenta* and on *Salamandra maculosa* is recorded. It is thought that there are probably three active generations annually in Normandie (Normandy) and Brittany.

The walnut husk maggot, F. L. GAMBRELL (*North. Nut Growers Assoc. Proc.*, 22 (1931), pp. 110–115).—This is a practical account of the walnut husk fly contributed from the New York State Experiment Station. It is pointed out that this pest appears to be rather generally distributed throughout north-eastern and central United States, it being not uncommon to observe infested nuts anywhere within this area. Experiments are said to indicate that two applications of 3 lb. of arsenate of lead, preferably combined with lime-sulfur, dry-mix, kayso, or lime, will afford a satisfactory degree of control. The first spray is usually applied about the last week in July and the second from 10 days to 2 weeks later.

The apple maggot, A. C. HOBSON (*Minn. Hort.*, 62 (1934), No. 7, p. 133, figs. 2).—A practical contribution from the Minnesota Experiment Station.

Biological studies on the cucurbit-leaf beetle, *Ceratia similis* (Olivier) (Chrysomelidae, Coleoptera), with special reference to control with arsenical insecticides, V. J. MADRID (*Philippine Agr.*, 23 (1934), No. 3, pp. 197–225, figs. 2).—This contribution relates to a beetle widely distributed in the Philippines and Indo-Malayan countries, where it is a serious pest of cucurbitaceous plants, including squash, upo, melon, cucumber, etc., and wild cucurbits. Studies of its biology and means of control are reported, the details being presented in 16 appended tables. The complete life cycle (from egg to egg) ranged from 86 to 131 days, with an average of 104.84 ± 11.75 days. Lead arsenate spray and calcium arsenate, either in the form of dust or spray, have been found effective in controlling the attack of the beetles.

New species of the genus *Chrysobothris*, with a key to the species of Horn's group IV (Coleoptera, Buprestidae), W. J. CHAMBERLIN (*Pan-Pacific Ent.*, 10 (1934), No. 1, pp. 35–42, figs. 28).—In this contribution from the Oregon Experiment Station the author describes two new flat-headed borers, *C. canadensis* and *C. oregona*, both from Oregon and the former also from Alberta. An illustrated key for the separation of species of *Chrysobothris* of this group is included.

The life-history and seasonal abundance of the vesicating beetle, *Paeoderus fuscipes* Curt., P. V. ISAAC (*Indian Jour. Agr. Sci.*, 4 (1934), No. 1, pp. 200–202, pl. 1).—A brief summary of information on the biology of this beetle.

Phyllophaga of Iowa, B. V. TRAVIS (*Iowa State Col. Jour. Sci.*, 8 (1934), No. 2, pp. 313–345, pls. 9, figs. 2).—This contribution from the Iowa Experiment Station recognizes and describes 33 species of May beetles of the genus *Phyllophaga* found in Iowa. A table for their separation and a 4-page list of references to the literature are included.

The use of naphthalene against the Japanese beetle, W. E. FLEMING and F. E. BAKER (*U. S. Dept. Agr., Tech. Bul.* 427 (1934), pp. 28).—In this contribution the authors bring together the results of experimental work relating to the use of naphthalene against the Japanese beetle.

It is pointed out that "the determination of naphthalene as naphthalene picrate is relatively slow and requires careful standardization of each step in

the procedure to obtain consistent results. The determination of the compound by oxidation to phthalic acid is more rapid and gives results in close agreement.

"The physiological action of the vapor on the immature stages of the Japanese beetle is not clearly understood. Eggs and larvae exposed to the vapor become reddish in color, the intensity depending on the period of exposure. The vapor paralyzes the immature stages and finally causes their death. The resistance of the different stages increases in this order: (1) Larva, (2) egg, and (3) pupa. The period of exposure necessary for a saturated atmosphere of naphthalene to kill depends upon the temperature, ranging from 12 hr. at 80° F. to 120 hr. at 50°. The relative humidity of the atmosphere influences to some extent the insecticidal action on larvae, the mortality increasing with the increase in relative humidity.

"The larvae can be destroyed in potting soil by applying naphthalene crystals at the rate of 5 lb. per cubic yard, provided the soil is moist (but not wet) and free from large lumps; that the temperature is above 50°; and that the soil is left undisturbed for 1 week. Insecticidal tests and chemical analyses show that naphthalene is decomposed rapidly in the soil and under normal conditions would disappear within 14 days. Organic matter in the soil in the form of peat hastens the decomposition. Different potted plants, including *Araucaria excelsa*, *Cyclamen* sp., *Aspidistra* sp., *Poinsettia* sp., *Rosa* sp., *Hydrangea* sp., and *Deutzia* sp., have been grown successfully in soil previously treated with naphthalene crystals. It was found impossible to apply naphthalene crystals to the soil of potted hydrangeas in sufficient quantity to destroy the larvae without causing serious injury to the plants.

"When infested pots of soil and infested soil balls were placed in a saturated atmosphere of naphthalene, the vapor penetrated only slowly into the soil. The best results were obtained by vaporizing the crystals over hot water in an atmosphere having a relative humidity of 90 to 95 percent. The plants, however, could not withstand the long exposure necessary to destroy the insect.

"Naphthalene vapor did not protect either roses or ripening fruit from attack by the adult beetle.

"Mixing naphthalene crystals with soil at the rate of 1,000 lb. per acre was found, under insectary conditions, to prevent oviposition but did not keep the females from burrowing into the soil. The periodic application and mixing of naphthalene into soil about the roots of annual flowers during the flight of the adult beetle reduced the larval population in the soil; however, the results were not sufficient to warrant recommending the procedure as a control measure.

"From this investigation it was concluded that naphthalene when applied to soil is an effective insecticide for destroying the immature stages of the Japanese beetle. It cannot be used in insecticidal concentrations to destroy the insect in the soil about the roots of growing plants. Thus, its use is limited to conditions where the soil can be treated before the plants are set. The compound has little value as a repellent against the adult beetle."

A list is given of 55 references to the literature.

Control of white grubs in Quebec [trans. title], G. H. HAMMOND and G. MAHEUX (*Min. Agr. Prov. Québec Bul.* 130 (1934), pp. 15, figs. 6).—This contribution presents notes on the biology of white grubs and deals at some length with means for their control in three zones in the Province of Quebec.

The determination of larval instars and stadia of some wireworms (Elateridae), W. A. McDougall (*Queensland Agr. Jour.*, 42 (1934), No. 1, pp. 43-70, figs. 6).—The details of a study conducted by the author are presented in tabular, photographic, and graph form. The reliability of larval length, antennal segment ratios, head width, and the greatest width of the ventral mouth

parts as criteria for determining larval instars of *Lacon variabilis* are discussed.

The effect of cool temperatures on some stages of the cigarette beetle, S. E. CRUMB and F. S. CHAMBERLIN (*Fla. Ent.*, 18 (1934), No. 1, pp. 11-14).—The commercial use of cool chambers for the storage of surplus stocks of cigars led to a study of the effect of these moderately cool temperatures, 50° to 65° F., on the cigarette beetle. The results of experimental work conducted at Tampa, Fla., in 1927-28, the details of which are presented in tabular form, have led to the conclusion that "at a temperature of from 50° to 60° eggs do not hatch and they are nonviable upon removal to normal temperature after an exposure of 35 days; a limited number of experiments with just-hatched larvae indicate that these larvae do not survive an exposure of 21 days; large larvae survive for at least 45 days and sometimes puncture cigars at this temperature. At 56° eggs do not hatch, and they are nonviable upon removal to normal temperatures after an exposure of 33 days. At a temperature of 65° development of all stages of the beetle continues at a reduced rate; eggs hatch, larvae pupate, adults emerge, and adults and the surviving larvae puncture the cigars. The newly-hatched larvae seem to be very susceptible to reduced temperature, and very few small larvae survive after the eggs and resulting larvae have been exposed for a period of 32 days at this temperature."

Notes on the life-history of the death watch beetle, D. E. KIMMINS (*So. London Ent. and Nat. Hist. Soc. Proc.*, 1933-34, pp. 133-137, pl. 1).—This contribution relates to *Xestobium rufovillosum* DeG., the larva of which bores in dead wood and structural timber, it having been recorded from oak, chestnut, willow, beech, hawthorn, and ash in the open, and indoors in structural oak and chestnut, while occasionally pine has been damaged when fastened against oak. The burrows have also been found in old books, into which the larvae had tunneled from old oak bookcases, and the pest is a frequent cause of damage to the roofs of old buildings.

The egress of the ichneumonid parasite *Nemeritis canescens* Grav. from and the role of olfaction in its return to the host [trans. title], I. VON STEINBELING (*Biol. Zentbl.*, 54 (1934), No. 3-4, pp. 147-169, figs. 3).—This contribution on the biology of the *N. canescens* parasite of the Mediterranean flour moth deals particularly with its food habits and flight experiments.

A list is given of 15 references to the literature.

The development of a colony of *Aphelinus mali* Hald., W. R. THOMPSON (*Parasitology*, 26 (1934), No. 3, pp. 449-453, fig. 1).—A brief account is given of the development of a colony of the chalcid parasite *Aphelinus mali* Hald. at the expense of its host, the woolly apple aphid.

Some effects of refrigeration on the biology of *Trichogramma* in artificial breeding, J. C. SCHREAD and P. GARMAN (*Jour. N. Y. Ent. Soc.*, 42 (1934), No. 3, pp. 263-283).—It was found that *T. pretiosa* and *T. minutum* reared in Angoumois grain moth eggs are affected by refrigeration in the following ways: "(1) At temperatures below 47° F. mortality is gradual and increases with the length of exposure. There is some survival with refrigeration extended to 72 days, but the percentage is so small that it is worthless for production purposes. (2) The sex ratio is upset when temperatures below 47° are employed, the change being more evident in the generation following than in the generation emerging from refrigerated eggs. (3) Wing deformity is directly proportional to length of refrigeration and indicates a general weakening of the individuals. There are some differences in the ability of the two species considered to survive exposure to cold.

"Results of a comparison of refrigeration of the parasite in oriental fruit moth and grain moth eggs indicate (1) that mortality in general is greater with short exposures in fruit moth eggs than in grain moth eggs. (2) At 37° mortality of [*T.*] *pretiosa* is less in oriental fruit moth eggs after 30 days than in grain moth eggs. (3) There is some indication that mortality is lower with [*T.*] *pretiosa*, the yellow species native to Connecticut, than with [*T.*] *minutum*, both in grain moth and fruit moth eggs. (4) The survival in grain moth eggs for [*T.*] *pretiosa* is greater than fruit moth eggs at the same temperature, but less in grain moth eggs for [*T.*] *minutum*; the latter results, however, are not strictly comparable because of differences of humidity."

A new wheat pest in Ohio, J. S. HOUSER (*Ohio Sta. Bimo. Bul.* 170 (1934), pp. 169-171, figs. 2).—During the course of the annual wheat field survey in Ohio, noted on page 218, a new pest which has been identified as the black wheat stem sawfly, *Trachelus tabidus* (Fab.), was discovered attacking wheat and causing significant damage. This insect, European in origin, was first discovered at Riverton, N. J., some time prior to 1899. It was recorded by E. N. Cory in 1914 as an enemy of wheat in Maryland. In Ohio it was first found in a field near North Lima, Mahoning County, in which the standing grain was seriously lodged. Later infestations were found in some 10 other counties in eastern Ohio. The most severely damaged field was encountered in Columbiana County, in which 68 percent of the straws of a sample selected at random in the field was infested. One field of rye growing in the area of severe infestation was not damaged, but two others were 7 and 16 percent infested, respectively. No infestation was found in oats.

Reference is made to the report of a study of the pest by Gahan (E. S. R., 43, p. 363).

Further observations on the control of the apple sawfly, *Hoplocampa testudinea* (Klug.), H. G. H. KEARNS and T. SWARBRICK (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1932, pp. 90-94).—In further work (E. S. R., 68, p. 781), an efficient control of apple sawfly (*H. testudinea*) larvae on the Worcester Pearmain variety is said to have been obtained by spraying the fruitlets with a nicotine wash, at the rate of 8 oz. to 100 gal. of water plus a suitable spreader, from the sixth to twelfth day after petal fall.

A derris rape oil emulsion provided a result equal to that obtained with a nicotine wash applied at the same date and period after petal fall. A derris soap wash (representing a concentration of 0.004 percent of rotenone) provided a fairly satisfactory control, but not equal to that obtained with the derris emulsion or with nicotine.

A colloidal lead arsenate wash and a pyrethrum emulsion (representing a concentration of 0.5 percent of the flowers) each reduced the infestation by 50 percent.

A new predacious mite from southern California (Acarina, Erythraeiidae), W. EBELING (*Pan-Pacific Ent.*, 10 (1934), No. 1, pp. 33, 34, fig. 1).—In contributing from the California Citrus Experiment Station the author describes a new predacious mite, found on the branches of lemon trees heavily infested with the California red scale, under the name *Erythraeus aonidiphagus* n. sp.

ANIMAL PRODUCTION

[Experiments with livestock in Puerto Rico] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt.* 1933, Spanish ed., pp. 112, 113).—Results are reported on the feeding of byproducts of the alcohol industry to cattle and on the feeding of minerals to hogs.

Effect of feeding with corn, barley, and other cereals on the development and chemical composition of the bones [trans. title], J. C. DE R. DE WILDT and E. BROUWER (*Dept. Econ. Zaken en Arbeid [Netherlands], Verslag. Landbouwk, Onderzoek, No. 38 C (1932), pp. 275-300, fig. 1; Ger. abs., p. 299; Eng. abs., p. 300*).—Experiments with rats at the Imperial Agricultural Station, Hoorn, showed that barley meal (from the whole grain) contained appreciable amounts of vitamin D, while corn contained none of this vitamin. In a mixture of gluten meal, calcium carbonate, and salt 20:3:1, the addition of 76 parts of either corn, barley, rye, wheat, or oatmeal caused varying degrees of rickets. The severity of rickets was most pronounced on the corn ration and least pronounced on barley. Adding small amounts of sodium phosphate to bring the phosphorus content of the diets to the same level caused no appreciable change in bone formation or composition.

Animals on the oats ration made the least growth and those on the barley and rye rations the best growth. The wheat and corn rations occupied an intermediate position, with wheat slightly superior to corn in this respect.

Emergency feeding of livestock, J. L. LANTOW and O. C. CUNNINGHAM (*New Mexico Sta. Bul. 227 (1934), pp. 16, figs. 5*).—This bulletin was prepared to call to the attention of stockmen the value of various available low-grade feeds for carrying their livestock through the period of extreme feed shortage.

The nutritive value of legume husks, R. G. LINTON, A. N. WILSON, and S. J. WATSON (*Jour. Agr. Sci. [England], 24 (1934), No. 2, pp. 260-268*).—In this paper from the Royal Veterinary College, Edinburgh, the chemical composition, digestibility, and nutritive value of bean husks, pea husks, and lentil husks are reported. Both bean and pea husks had fairly high starch equivalents. The starch value for lentil husks was of the same order as that of bean husks, but in addition they also contained some digestible crude protein.

Nutritive value of lucerne, I, II, H. E. WOODMAN, R. E. EVANS, and D. B. NORMAN (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 419-458; 24 (1934), No. 2, pp. 283-311*).—This series of investigations was undertaken at Cambridge University to determine the nutritional characteristics of lucerne (alfalfa).

I. Preliminary studies of yield, composition, and nutritive value (season 1932).—This paper presents preliminary results of studies on lucerne crops of various ages taken during the season of 1932, which was characterized by its cold, wet, late spring and by drought during June.

On a dry-matter basis the prebudding plants contained 35 percent of crude protein and 13.7 percent of fiber. The bud-stage plant had 20.4 percent of protein and 24 percent of fiber, while at the flowering stage there was present 17.4 percent of protein and 29.7 percent of fiber. The lime content varied from 2.2 to 2.5 percent in the different samples, and there was no evidence of a rise in this factor as the plant matured. The phosphoric acid content was highest in the early samples and lowest at the flowering stage. The potash content also decreased as the plant matured. Lucerne was lower in ether extract and slightly lower in nitrogen-free extract and chlorine, and the organic sulfur content was about the same as that obtained for pasture herbage.

Digestion trials showed that lucerne, both in the bud and flower stages, was distinctly inferior in respect to digestibility and nutritive value to pasture herbage cut at intervals of from 1 to 5 weeks.

II. Investigations into the influence of systematic cutting at three different stages of growth on the yield, composition, and nutritive value of lucerne.—This phase of the above study was planned to determine the composition, digestibility, and nutritive value of first-, second-, and third-cutting lucerne under conditions of systematic cutting at the bud and flower stages. The digestibility

and nutritive value of the plant in the prebudding stage was determined, and account was taken of the effect of cutting at different stages on the yields of dry matter per acre, starch equivalent, and digestible protein, and on the health and vigor of the crop.

The highest digestibility was obtained at the earliest stages of growth, at which time the dry matter was richest in starch equivalent and digestible protein. The dry matter of the prebudding lucerne approximated that of a protein-rich concentrate. Young lucerne produced fiber much more rapidly than grass. Because of this fiber content and its relatively low content of digestible organic matter and starch equivalent, the dry matter of lucerne, in both bud and flowering stages, was comparable in nutritive properties to a superior coarse fodder rather than to pasture herbage.

Third-cutting lucerne was richer in protein than first or second cuttings. The second prebudding growth had the lowest dry matter and crude fiber contents and the highest crude protein and phosphoric acid contents. The later cuttings had a higher leaf-stem ratio than the earlier cuttings. Second-flowering growth was distinctly superior in digestibility and nutritive value to first-flowering growth, but this distinction was not evident in the budding cuts. Cutting at the flowering stage produced 7,551 lb. of dry matter per acre, at the budding stage 84.4 percent of this yield, and at the prebudding stage 52.5 percent of this yield. Early cutting appeared to injure the plants and shorten the life of the stand.

Vitamin A value of alfalfa cut at different stages of maturity, S. M. HAUGE (*Jour. Assoc. Off. Agr. Chem.*, 17 (1934), No. 2, pp. 304-307, fig. 1).—Continuing the investigations on alfalfa hay at the Indiana Experiment Station (E. S. R., 67, p. 59), samples were selected from luxuriantly growing young alfalfa plants cut when 10 to 12 in. high and before they showed any bloom and from vigorously growing plants in the full-bloom stage. The samples were cured in different ways. The vitamin A value of the samples was determined by biological assays and by the use of the curative method with rats.

It was found that young alfalfa was much higher in vitamin A content than alfalfa in the full-bloom stage. The leaves contained the highest concentration of vitamin A, while the stems had a low value. Alfalfa products that were sterilized immediately after cutting and then sun-dried had a higher vitamin A value than unsterilized alfalfa either sun-dried or field-cured. The degree of maturity of the plants, the conditions of the curing process, and the retention of leaves were important factors affecting the vitamin A value of alfalfa hay.

Grading meat: The prices given for carcasses of different weights and qualities, J. HAMMOND and G. N. MURRAY (*Jour. Agr. Sci. [England]*, 24 (1934), No. 2, pp. 233-249, figs. 5).—In this paper from Cambridge University the results are reported of an attempt to obtain facts on which a scientific system of grading meat carcasses could be based. The prices obtained for the carcasses at the auction sale at the Smithfield show in London were statistically analyzed, the breed, age, and weight of each carcass for the years 1922 to 1931, inclusive, being recorded.

There was a greater difference in price due to weight than to quality of carcass. On this basis it would seem that the first essential in grading meat carcasses would be to make weight classes and then to subdivide these classes into grades according to quality. Within each weight class the quality would depend upon the proportions of fat, muscle, and bone in each carcass. Within each breed of livestock, the decrease in price with increase in weight of carcass

was due to an increase in the size of cuts and to an increase in the proportion of fat with increasing weight.

From the weight-price curves it was possible to calculate with a fair degree of accuracy the price of carcasses of any other weight when the price at any one weight was known.

Methods of utilizing the corn crop for fattening steers, G. A. BRANAMAN and R. S. HUDSON (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 1, pp. 24-28).—Continuing this study along the same lines (*E. S. R.*, 70, p. 75), it was found that the steers receiving ground shock corn made an average daily gain of 1.8 lb., those receiving corn silage 2.1 lb., and those receiving shock corn 1.7 lb. per head during a 154-day feeding period. The returns per acre of corn as fed were \$7.58, \$28.13, and \$12.79, respectively. The labor and machinery costs for grinding the shock corn were responsible for the poor showing of this lot.

The test was continued for an additional 32 days, and for this period the respective lots made average daily gains of 1.6, 1.9, and 1.6 lb. per head. The price of cattle rose sharply during this last period so that the return per bushel of corn fed was 31, 89, and 42 ct. as compared with a return of 19, 70, and 32 ct. per bushel in the respective lots that would have been returned at the end of the 154-day feeding period.

Cottonseed meal in rations of horses and mules, R. H. WILLIAMS and J. M. and J. H. JONES (*Texas Sta. Bul.* 492 (1934), pp. 30, figs. 10).—In this investigation 9 comparable groups, including more than 80 animals of varying ages, were fed for periods of from 224 days to 2 yr. to determine the nutritive value of cottonseed meal.

Heavy artillery horses that received cottonseed meal made average daily gains of 23.3 ± 9.5 and 20.9 ± 5.5 lb. more per head during 2 tests of 1 yr. each than the control groups fed the standard army ration of oats and prairie hay. Young mules and colts fed cottonseed meal from weaning time developed faster, shed earlier, and weighed more at 1 yr. of age than those not receiving this supplement. Mares fed 2 lb. of cottonseed meal were good sucklers and raised heavy foals.

A ration containing 1 lb. of cottonseed meal was palatable to 95 percent of the animals, and no difficulty was experienced in getting the animals to eat 2 lb. Some animals were slow in acquiring a taste for cottonseed meal, but none refused it. No injurious effects were observed when either 1 or 2 lb. of cottonseed meal were fed daily, and if added to a ration not adequate in protein content it was a useful and economical feed.

Keeping a dog: Its training and care in health and sickness, R. F. WALL (*London: A. & C. Black, 1933*, pp. X+135, pls. 2, figs. 6).—In this treatise the author gives practical advice on the choice of a dog, training, housing, feeding, breeding, and care in health and sickness.

More fur-bearing animals, H. PATTON (*Chicago: Clement V. Ritter, 1934*, pp. XI+191, figs. 39).—This is a supplement to the treatise previously noted (*E. S. R.*, 54, p. 273) and includes information on the care and raising of the Angora wool rabbit, fitch, nutria, and fisher. Revisions on silver fox, mink, and muskrat management are also included.

Studies in the nutrition of the chick: An attempt to simplify the successful diet, W. R. GRAHAM, JR., J. H. PETTIT, J. F. SYKES, and G. E. HOWELL (*Poultry Sci.*, 13 (1934), No. 3, pp. 166-177, figs. 7).—A series of experiments at the Ontario Agricultural College with chicks fed various simplified diets from their first feed showed that normal growth from hatching up to 12 weeks of age could be obtained on a diet of technical casein, cornstarch, yeast, wheat

germ, salt mixture, and cod-liver oil 20:46:15:10:4:5. This diet when continued also supported reproduction.

The results are reported of an attempt to extract from wheat germ middlings the factor active in promoting growth and livability.

Ground oats as a substitute for wheat bran and wheat middlings in rations for chicks, R. E. ROBERTS and C. W. CARRICK (*Poultry Sci.*, 13 (1934), No. 3, pp. 135-140).—A series of experiments involving 14 lots of chicks was conducted at the Indiana Experiment Station to obtain information on the relative value of oats as a substitute for wheat bran and wheat middlings in starting rations.

It was found that substituting 30 percent of ground oats for 15 percent each of wheat bran and wheat middlings did not materially affect the rate of growth, mortality, or amount of feed required to produce a unit of gain during the first 8 or 10 weeks. When used in the above manner ground oats had the same efficiency regardless of whether a combination of 12 percent of meat and bone scraps and 4 percent of dried milk or 15 percent of meat scrap and 5 or 6 percent of dried milk was used as a protein supplement.

Comparison of scabbed barley, normal barley, and yellow corn in diets for laying chickens, H. W. TITUS and A. B. GODFREY (*U. S. Dept. Agr., Tech. Bul.* 435 (1934), pp. 10, figs. 3).—This study was undertaken to determine the comparative value of rations containing relatively large quantities of the above-named grains. Tests of 100 and 48 weeks, respectively, were conducted, in the first of which Rhode Island Red pullets were used, and in the second test White Leghorn pullets.

In neither test were significant differences in live weight between lots observed. During molt the Rhode Island Reds that received the corn ration lost more weight than birds from the other pens. The egg production was quite similar in the comparable pens, except that one pen of Rhode Island Reds receiving scabbed barley did not lay as well as the other pens. In both tests the birds receiving corn produced more eggs per pound of feed consumed than did those receiving either normal or scabbed barley. Scabbed barley whether slightly, moderately, or heavily scabbed could be expected to give essentially the same results as normal barley for the maintenance of live weight, egg production, and economy of egg production.

The comparative antirachitic efficiency of irradiated ergosterol and cod-liver oil for the chicken and a description of a more reliable method for the determination of rachitic leg weakness in baby-chickens, M. J. L. DOLS (*Arch. Néerland. Sci. Exact. et Nat.*, 19 (1934), No. 2, pp. 290-294).—In studies at the University of Amsterdam day-old chicks were fed a basal rickets-producing ration of ground yellow corn, wheat middlings, crude casein, dried brewers' yeast, precipitated calcium carbonate, and salt. This ration contained 0.45 percent of phosphorus and had a calcium-phosphorus ratio of about 4:2. In the lots receiving irradiated ergosterol, carotene was added as an additional source of vitamin A. The vitamin D potency of the cod-liver oil and the solutions of irradiated ergosterol were tested on white rats receiving the same basal ration as the chicks. For estimating the prophylactic dose of vitamin D the X-ray examination was used, and for determining the presence of rickets the post-mortem examination of the ribs was applied.

The following supplements in the order of their value were protective against rickets: 2 percent of cod-liver oil, irradiated ergosterol dissolved in 2 percent of peanut oil with carotene equal to 200 percent of cod-liver oil, and 1 percent of cod-liver oil plus 1 percent of peanut oil with carotene. The supplements irradiated ergosterol dissolved in peanut oil with carotene equal to 2 and 20 per-

cent of cod-liver oil, respectively, were not protective against rickets. The ribs of rachitic birds showed an inward curvature at the junctions of the vertebral and sternal portions, beading, and enlargements at the costovertebral junctions. A wavelike formation of the ribs was also noted.

The author discusses the value of the methods used for determining the vitamin D requirements of chicks.

The amount of vitamin A potency required by hens for egg production, R. M. SHERWOOD and G. S. FRAPS (*Texas Sta. Bul.* 493 (1934), pp. 22).—Continuing this study (E. S. R., 71, p. 686), White Leghorns that had been raised on a standard ration including free access to green feed were divided into three lots of 18 pullets and 18 hens each. Two cockerels were rotated from group to group for a period in order to secure eggs suitable for hatching. The basal ration was the same for all lots, but in one group 4 percent of heat-dried alfalfa leaf meal and in a second group 8 percent of the same meal replaced like amounts of wheat bran. These rations supplied 224, 336, and 444 rat units of vitamin A daily. The experimental period was of 290 days' duration.

Mortality was highest in the lot receiving the lowest amount of vitamin A. Body weight was highest in lot 3 and progressively decreased with the vitamin A content of the ration. The differences in weight appeared after the fourth month of feeding. The egg production was approximately the same in the two lots receiving the lower amounts of vitamin A, but was 15 percent higher in the other lot. The vitamin A content of eggs from all lots decreased as the laying period progressed, the rate of decline being highest in the lot receiving the highest amount of vitamin A. At the end of 9.5 mo. feeding, the yolks of the respective lots contained 6, 12, and 15 units of vitamin A per gram. In two tests the percentage of eggs hatched increased with the increase in the amounts of vitamin A in the feed, but the percentage hatch was not closely related to the amount of vitamin A in the eggs. One unit of vitamin A in the eggs required 6.3 units in feed when 270 units daily were fed, 5.7 units when 336 units were fed, and 4 units when 444 units were fed.

It is concluded that rations usually fed to laying hens do not contain enough vitamin A for maintenance and high egg production unless birds have access to green feed.

Phosphorus partition in chicken blood as related to diet and bone maladies, V. G. HELLER, B. ZIMMERMAN, and R. B. THOMPSON (*Poultry Sci.*, 13 (1934), No. 3, pp. 141-147, fig. 1).—Continuing the study of the blood phosphorus of chickens at the Oklahoma Experiment Station (E. S. R., 68, p. 367), mature chickens and young chicks were fed rations containing various levels of both calcium and phosphorus.

The data obtained indicated that the reported total inorganic phosphorus of the blood serum as determined by many investigators was subject to criticism, and that such reports probably did not accurately picture the real conditions. This was especially true in view of the very high total phosphorus of the blood of the chick and the possible activity of enzymes capable of converting one form of the phosphorus to another.

The effect of kamala on egg production and egg weight, A. J. G. MAW (*Poultry Sci.*, 13 (1934), No. 3, pp. 131-134, figs. 2).—In an experiment at MacDonald College, Canada, it was found that the administration of 1 g of kamala to pullets shortly after they began to lay invariably brought about a decrease in egg weight, and except in a few individual cases a decline in production. While all parts of the egg decreased in weight, the yolk showed the largest percentage decrease. There was considerable individual variation in the reaction of birds to kamala, and the recovery from its effects was quite rapid.

Gossypol, a cause of discoloration in egg yolks, P. J. SCHAIBLE and L. A. and J. M. MOORE (*Science*, 79 (1934), No. 2051, p. 372).—Cottonseed meal, cottonseed meal autoclaved at 20-lb. pressure for 4 or 24 hr., acid- and ether-extracted cottonseed meal, raw cold-pressed cottonseed oil, and crude and purified gossypol were fed to laying birds at the Michigan Experiment Station. The yolks of the eggs produced by these birds were naturally discolored or developed discoloration during storage at 30° C. or in the atmosphere of ammonia. Ferrous sulfate fed at levels of 1 or 2 percent protected against discoloration in rations containing as much as 40 percent of cottonseed meal.

Quercetin, cottonseed hulls, refined cod-liver oil, acid-extracted cottonseed meal, and ether-extracted raw cottonseed did not discolor egg yolks. Since gossypol was present in the rations that caused discoloration and absent in those that did not discolor yolks, it was concluded that free or bound gossypol was responsible for the condition. Feeding gossypol resulted in yolk-spotting and small egg size similar to the conditions in eggs produced when cottonseed products were fed.

Natural iron found in feeds of high iron content was beneficial but insufficient to take care of 25 percent of cottonseed meal in a ration. The beneficial effect of soluble iron was proportional to the gossypol content of the cottonseed meal used. It was suggested that from a commercial standpoint eggs suspected as coming from flocks fed cottonseed meal be tested by the ammonia treatment and if yolk-spotting occurs the eggs should not be placed in storage.

Interrelationship of body weight, production, and egg weight, G. W. KNOX, JR. (*Poultry Sci.*, 13 (1934), No. 4, pp. 227-229).—This statistical analysis was based on the records of 914 White Leghorn pullets and 365 general-purpose pullets (Plymouth Rocks, Rhode Island Reds, and Wyandottes) from the fifth Georgia egg-laying contest and the second, third, and fourth Louisiana egg-laying contests.

A significant correlation was found between initial body weight and average egg weight, indicating that the heavier the bird in the fall the larger was the average egg weight for the year. The same correlation was found between average body weight during the pullet year and average egg weight. A significant negative correlation was found between initial body weight and total number of eggs laid in one group of White Leghorns, but in no other case were these characters significantly associated. The relationship of yearly egg record and average egg weight was not significant. None of the correlations had any value for predicting egg production of Leghorn or general-purpose pullets.

The relationship of anatomical measurements to egg production, M. W. MILLER and J. S. CARVER (*Poultry Sci.*, 13 (1934), No. 4, pp. 242-249, figs. 3).—Measurements were taken on hens near the end of the first producing year at the Washington Experiment Station to determine the relationship of certain head and body measurements to egg production. This was done with the idea that a method for selecting hens for egg-producing qualities might be developed, doing away with the necessity of using trap nests. Both White Leghorn and Rhode Island Red hens were measured.

No significant relationship was found between anatomical body measurements and egg production of either breed. Small and fairly significant negative coefficients of correlation were obtained between head measurements and production of Rhode Island Red hens, but these factors were not related in White Leghorns. A multiple correlation coefficient of 0.391 ± 0.056 was found between the head measurements of the Rhode Island Reds and their egg production.

It was concluded that culling score cards place too much emphasis on the anatomical characteristics of White Leghorn and Rhode Island Red birds.

Relation of juvenile plumage to growth and sexual maturity, D. R. MARBLE (*Poultry Sci.*, 13 (1934), No. 4, pp. 195-201).—Analyses at the Pennsylvania Experiment Station of data on 90 Single Comb White Leghorn females and 73 males from 1 day old to 20 weeks of age showed two peaks of body molt and one complete wing and tail feather molt following the original growth of these feathers. There was no significant change in the rate of body growth during these peaks of body plumage development. However, there were significant positive correlations in both sexes between the body weight at 4, 8, 12, 16, and 20 weeks of age and the amount of body molt completed at the respective ages.

Analyses of data obtained on White Leghorn pullets (79 in 1930 and 308 in 1932) showed that it was not possible to predict the date of first egg on the basis of primary feather development examination at 8 or 10 weeks of age. There was a tendency for early-maturing pullets to carry over one or more chick feathers during the first laying year.

The feasibility of sex segregation in day-old chicks, M. A. JULL (*Poultry Sci.*, 13 (1934), No. 4, pp. 250-254, figs. 4).—The results are reported of an examination of several thousand chicks ranging from about 12 to about 35 hr. old by four technical investigators at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., to determine the practical aspects of segregating sexes among day-old chicks.

Sexing baby chicks, C. S. GIBBS (*Poultry Sci.*, 13 (1934), No. 4, pp. 208-211).—In this article from the Massachusetts Experiment Station the author describes the principles and practices of differentiating sex in living baby chicks.

Fertility studies in poultry, C. NICOLAIDES (*Poultry Sci.*, 13 (1934), No. 3, pp. 179-183).—Studies were conducted at the Massachusetts State College to throw light upon the problem of fertility in the domestic fowl. Fertility results were obtained from single controlled matings and from a direct comparison of fertility under stud mating and pen mating with Rhode Island Red birds.

The data showed that fertilization may take place in the upper end of the albumin-secreting portion of the oviduct of the hen. The time elapsing between mating and the appearance of the first fertile egg varied from 19.5 to 238 hr., with an average of 66.2 hr. Ordinarily a fair percentage of fertile eggs was obtained the day following mating. From 1 to 14 eggs were fertilized from a single mating, and there was a tendency for the more intensive layers to show a higher fertility. The average duration of fertility from a single mating was 14.8 days with a maximum of 29 days. Of the 68 single matings, 58 produced fertile eggs and 82 percent of the total eggs were fertile, indicating that in stud mating, mating after each egg was not required. There was no significant difference in fertility resulting from stud mating and pen mating.

Relationship between age, fecundity, and hatchability, J. H. MARTIN and W. M. INSKO, JR. (*Poultry Sci.*, 13 (1934), No. 3, pp. 188-190, fig. 1).—In this paper from the Kentucky Experiment Station the egg production of White Leghorn hens, selected on the basis of a 200-egg production during the pullet year, over a period of 7 yr. is reported. The hatching records of the birds over this same period are also presented. There was a slight tendency for fertility to decline with age.

Relation of time of laying to hatchability, E. M. FUNK (*Poultry Sci.*, 13 (1934), No. 3, pp. 184-187).—The Missouri Experiment Station made a study of the hatching results of 16,839 eggs laid at different times of the day during the hatching seasons of 1931, 1932, and 1933.

Eggs laid in the afternoon had a statistically significant increase in hatchability over eggs laid in the morning. Holding eggs in an incubator at 101° F.

for 6 hr. immediately after laying and before the eggs were cooled did not significantly increase hatchability. During 1933 an extremely cold week caused a wide variation in hatching results with a significant decrease in hatchability of eggs laid before 9 a. m. Increasing the length of day by the use of lights decreased the difference in hatchability of eggs laid at different times of the day during 1933, but had no apparent effect in 1932.

Management of early hatched pullets, L. M. BLACK (*New Jersey Stas. Hints to Poultrymen*, 21 (1934), No. 4, pp. 4).—Practical suggestions are given for the feeding, housing, and management of early-hatched pullets.

Studies of individual layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bmo. Bul.* 170 (1934), pp. 186-189).—Preliminary results of a study of individual laying birds and their significance are discussed.

Production of Ohio Record of Performance flocks, G. S. VICKERS (*Poultry Sci.*, 13 (1934), No. 3, pp. 155, 156).—The author has continued a tabulation of the results of the Ohio Record of Performance flocks (*E. S. R.*, 69, p. 847).

DAIRY FARMING—DAIRYING

[Proceedings of the fourth, fifth, sixth, and seventh annual State College of Washington Institute of Dairying] (*Wash. State. Col., Inst. Dairying Proc.*, 4 (1931), pp. 154; 5 (1932), pp. III+161; 6 (1933), pp. [2]+103; 7 (1934), pp. [3]+133, figs. 2).—The following papers were presented at the fourth annual meeting held at Pullman in February 1931: Making 93 Score Butter and Prevention of Waste in the Creamery, by S. G. Gustafson (pp. 3-5); Milk and Cream Grading for Butter Making, by W. G. Eddy (pp. 6, 7); Butter and Cheese Cultures, by G. Wilster and F. E. Price (pp. 8-24); The Manufacture of High Scoring Butter, by G. Wilster (pp. 25-36); Results of Researches on the Correlation of Various Cream Quality Tests with Resulting Butter Scores, by H. A. Bendixen (pp. 37-50); Bacteriological and Physical Effects of Alkalies and Chemical Sterilizers on Dairy Equipment, by C. C. Prouty (pp. 51-59); Cream and Milk Cooling Experiments, by F. E. Price and C. J. Hurd (pp. 60-66); Results from Six Months' Research in the Manufacture of Butter from Electrically Refrigerated Cream, by L. D. Searing (pp. 67-69); Market Milk Plant Problems, by G. W. Wilson (pp. 70-73); Modern Trend in Ice Cream Manufacture (pp. 74-87) and New Method of Standardizing the Ice Cream Mix (pp. 88-93), both by H. A. Bendixen; Standardization of Milk with Skim Milk Powder for the Manufacture of Cheddar Cheese, by H. C. Hansen and D. R. Theophilus (pp. 94-96); Acidophilus Milk—Details of Manufacture and Importance as a Dairy Product, by G. W. Wilson (pp. 97-101); Casein Manufacture as a Means of Utilizing Waste Skimmilk, by H. A. Bendixen (pp. 102-110); The New Magnetic Milker, New Milking Barn Arrangements, and the Rotolactor, by G. S. Gilmour (pp. 111-115); Latest Vitamin Developments of Interest to Dairy Men, by J. Sotola (pp. 116-119); How May City Inspection Be Made More Effective, by F. E. Smith (pp. 120-124); The Effect of Delayed Cooling on the Bacterial Content and Flavor of Raw Milk, by B. Sweeting and D. S. Courtney (pp. 125-137); Educating the Consumer to the Marvelous Value of Dairy Products in the Diet, by E. N. Hutchinson (pp. 138-144); Air Conditioning of Milk Storage Rooms, Direct Expansion Freezers, and Other New Developments in Dairy Machinery, by L. R. Doutré (pp. 145-150); and Cooperative Marketing, by P. S. Cornelius (pp. 151-154).

The following papers were presented at the fifth annual meeting held at Pullman, February 15-20, 1932: The Microscopic Examination of Butter and Its Application (pp. 1, 2) and Churn Contamination and the Determination of

Keeping Quality of Butter under Practical Conditions, (pp. 3, 4), both by J. A. Nelson; Latest Developments in the Manufacture of Ice Cream, by H. A. Bendixen (pp. 5-11); The Vogt Instant Freezer, by J. Gilmore (pp. 12-14); The Use of Pure Vanilla Extract from an Esthetic, Commercial, and Pure Food Standpoint, with Brief History of Its Source, by G. H. Farley (pp. 15-20); Coffee Cream and Whipping Cream Problems, by G. W. Wilson (pp. 21-26); Grading Market Milk for Quality, by J. A. Nelson (pp. 27, 28); The Present Status and Future Possibilities of the Manufacture of Cheddar and Foreign Types of Cheeses in the Pacific Northwest, by W. J. Wyrick (pp. 29-35); Cottage Cheese Today is Not Just "Curds and Whey", by H. A. Bendixen (pp. 36-41); Milk Sugar and Its Beta Derivative: The Importance and Possibilities as a Food, by F. M. Greenleaf (pp. 42-48); Neufchatel and Cream Cheese, by H. A. Bendixen (pp. 49-51); Quality Control of Market Milk, by B. Sweeting (pp. 52-58); Flash Heating and Cooling of Cream and Market Milk, by A. Jensen (pp. 59-77); The Nature and Control of Thermophilic Bacteria, by C. C. Prouty (pp. 78-83); Discussion, by J. Loop (pp. 84, 85); Sterilizing Dairy Utensils on the Farm, by D. R. Theophilus (pp. 86-88); The New Minnesota Babcock Test Reagent, by H. A. Bendixen (pp. 89-93); Minnesota Babcock Reagent, by J. F. Loop (pp. 94-102); Treatment of Water for Factory and Farm Use, by H. L. Cole (pp. 103-106); Some Physiologic Actions of Milk Products, by E. N. Hutchinson (pp. 107-111); The Vitamins as They Concern the Dairyman, by J. Sotola (pp. 112-119); Feeding for Milk Production in 1932, by J. C. Knott (pp. 120-126); Pasture Improvement, by R. E. Hodgson (pp. 127-130); Farmer Contacts, by R. Cowan (pp. 131-133); Farmer Contacts, by G. S. Bulkley (pp. 134-137); Summary of Dairy Cost of Production Study, by R. M. Turner (pp. 138-140); The Mineral Requirements of the Dairy Cow, by J. C. Knott (pp. 141-145); Abortion Disease, by E. E. Wegner (pp. 146-148); Udder Troubles, by J. E. McCoy (pp. 149-151); and Detection of Mastitis Milk, by C. C. Prouty (pp. 152-154).

The following papers were presented at the sixth annual meeting held February 13-18, 1933: Cream Grading in Alberta, Canada, by W. C. Cameron (pp. 1-13); Notes on Cream Grading in Washington, by L. W. Hanson (pp. 13-17); Increasing Vitamin D Potency in Milk, by E. V. Ellington (pp. 17-20); The Fermentation of Proteins in Cream, by C. C. Prouty (pp. 20-25); Creamery Butter Manufacture in Alberta, by W. C. Cameron (pp. 25-37); Neutralization of Cream for Butter Making, by N. S. Golding (pp. 37-41); Butter Grading, by W. C. Cameron (pp. 41-48); Recent Developments in the Fat-Soluble Vitamins of Milk, by E. L. Batchelder (pp. 48-57); The Desirability of a Test for *Coli-Aerogenes* Bacteria in Milk, by C. C. Prouty (pp. 57-59); The Preservation of Composite Samples, by G. W. Wilson (pp. 59-61); Commercial Soft Curd Milk, by D. S. Courtney (pp. 61-67); Some of the Heat Resisting Organisms in Evaporated Milk, by D. R. Theophilus (pp. 67-72); The Price Level: Deflation, Reflation, by R. B. Heflebower (pp. 73, 74); Some Factors Influencing the Creaming Ability of Market Milk, by D. S. Courtney (pp. 75-80); A Review of Recent Books Published on Dairy Manufacture, by N. S. Golding (pp. 81, 82); Manufacture of Natural Sour Casein, by R. Wood (pp. 83-87); The Functions of a Breed Association, by C. W. Robinson (pp. 87-90); Dairy Cattle Shows and a Discussion of Some Factors Connected with Their Success, by H. A. Mathiesen (pp. 90-93); The Dairy Program, by J. O. Tretsvén (pp. 93-96); and The Value of Dairy Herd Improvement Associations, by G. S. Bulkley (pp. 96-98).

The following papers were presented at the seventh annual meeting held March 5-10, 1934: Bacteriological Defects in Butter and How to Prevent

Them, by B. W. Hammer (pp. 3-6); Lessons from the Monthly Butter Scorings, by H. A. Bendixen (pp. 7-15); Butter Flavors, by B. W. Hammer (pp. 16-20); The Use of Paper for Packaging Dairy Products, by C. G. Bennett (pp. 21-27); Bacteriology of Ice Cream, by B. W. Hammer (pp. 28-30); Studies in the Manufacture of Dairy Products in Europe, by H. A. Bendixen (pp. 31-38); Cheddar Cheese from Pasteurized Milk, by J. L. Gaiser (pp. 39-41); The Possibilities for Roquefort Cheese in the State of Washington, by N. S. Golding (pp. 42-46); Vitamin D in Milk Products, by E. L. Batchelder (pp. 47-50); Educational Program of the Washington State Dairy Council, by M. G. Flanley (pp. 51-53); Quality Milk—Problems of Production and Distribution, by C. F. Webster (pp. 54-60); Latest Developments in Chemical Sterilization, by C. C. Prouty (pp. 61-64); Heat Resistant and Heat Loving Bacteria and Their Control in Pasteurizing Plants, by O. W. Espe (pp. 65-72); Advertising Health by the Dairy Industry, by S. E. Whitlow (pp. 73-75); Where is the New Deal Taking Us? by R. B. Heflebower (pp. 76, 77); Our Creamery Operators' Association's Aims and Problems, by R. S. Miller (pp. 78, 79); Some Applications of Psychology to Industry, by C. I. Erickson (pp. 80, 81); Feed-Water Purification, by F. W. Candee (pp. 82-84); Care of Creamery Equipment, by L. O. Ott (pp. 85-93); Experimental Methods with Dairy Cattle, by R. E. Hodgson (pp. 94-102); The Cost of Producing Dairy Products, by R. M. Turner (pp. 103-105); The Functions and Opportunities of State Breed and Dairy Associations, by I. W. Youngquist (pp. 106-109); Dairy Production Experiments in Progress at Various Experiment Stations, by R. E. Hodgson (pp. 110-116); A Program for the Pure-Bred Breeder, by C. W. Robinson (pp. 117-119); and Minerals for Dairy Cattle, by J. C. Knott (pp. 120-126).

A plan and preliminary results of a permanent pasture grazing test, E. C. ELTING and J. P. LAMASTER (*Jour. Dairy Sci.*, 17 (1934), No. 6, pp. 425-431, fig. 1).—During the growing seasons of 1929 and 1932, inclusive, the South Carolina Experiment Station conducted tests on 46 plats of old Bermuda grass pasture sod to determine the effect of various fertilizer treatments on the yield and composition of grass. The plats were on Cecil sandy clay loam with an average pH of 5.3. It was found that the only profitable fertilizer treatments were lime and phosphorus. Applying lime alone increased the yield 33.6 percent over the check plats, while phosphorus alone increased the yield 41 percent. A combination of lime and phosphorus increased the yield 79.5 percent.

During 1933 a grazing test was conducted to determine the value of established Bermuda pasture under three systems of fertilization. The first year's results showed that the application of 450 lb. of 16 percent superphosphate per acre yielded 927.5 more pounds of total digestible nutrients per acre than a similar field that had received no phosphorus fertilizer. This increase was equivalent to 1,796 lb. of alfalfa hay per acre that could be attributed to the fertilizer. Another pasture that received a heavy application of manure as the only treatment yielded 1,000.5 lb. more total digestible nutrients than the untreated pasture, a difference equivalent to 1,938 lb. of alfalfa hay.

The results indicated that Bermuda grass may be considered a very satisfactory dairy pasture, and that when it is supplemented with hop clover two weeks' earlier grazing may be secured.

Comparison of oat feed and oat straw for dairy cattle, G. E. TAYLOR and E. L. ANTHONY (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 1, pp. 15-23).—Using the double reversal method of feeding two tests were conducted with milking cows to compare the feeding value of oat feed and oat straw. In both tests a grain mixture, hay, and silage were fed.

It was found that these feeds were approximately equal as sources of energy for lactating cows. Both were slightly unpalatable when included in the grain mixture at the rate of 25 percent of the mixture. It is concluded that when oat feed could be purchased at a price equal to or lower than that of high-quality oat straw its use in the ration for dairy cows can be recommended.

Efficiency of feed utilization in dairy cattle, W. T. SMITH and V. A. RICE (*Guernsey Breeders' Jour.*, 46 (1934), No. 5, pp. 176, 177, 227, figs. 2).—This study at the Massachusetts Experiment Station was based on the records of 42 cows with 136 lactations of more than 200 days' duration each.

It was found that the average efficiency of feed utilization, based on total digestible nutrients in feed and milk, was approximately 30 percent. The level of efficiency was apparently an inherited characteristic, and was maintained by the animals from lactation to lactation. There was a decided positive correlation between the level of production and efficiency, but little or no correlation between age, weight, or amount of feed and efficiency. The range of efficiency for individuals varied from 18.1 to 39.6 percent.

The influence of inheritance and environment on the milk production and butterfat percentage of Jersey cattle, J. W. GOWEN (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 5, pp. 433-465, figs. 6).—In this study at the Maine Experiment Station the 364- to 366-day milk yield and butterfat records, corrected for age, of 14,000 Jersey Registry of Merit cattle were examined. Parent and offspring, grandparent and offspring, sistership and cousinship correlations were presented. These correlations showed that inheritance was responsible for about one-half of the observed variation in milk yield and four-fifths of the observed variation in butterfat percentage. Environmental variations were the cause of little of the variation in butterfat percentage and for only 10 percent of the milk yield variations. Dominance, assortive mating, and environmental variation common only to the individual cow were responsible for the rest of the variations in milk production and butterfat percentages.

The vitamin A requirements of dairy cows, G. S. FRAPS, O. C. COPELAND, and R. TREICHLER (*Texas Sta. Bul.* 495 (1934), pp. 21, fig. 1).—This investigation, including two separate experiments, was undertaken to determine the relation of the vitamin A content of butterfat at various stages of lactation to the vitamin A content of the feed and to obtain information regarding the number of units of vitamin A required for maintenance and for the secretion of vitamin A in butterfat.

The vitamin A in butterfat from a cow receiving 17,000 units in 6 to 7 lb. of yellow corn daily decreased from about 38 rat units per gram at the beginning of the test to 16 units in 4 weeks and 5 units in 5 mo. With a cow receiving 116,000 units daily from 7 lb. of corn and 6 lb. of heat-dried alfalfa meal the butterfat decreased from 33 units per gram at the beginning to 20 units in 4 weeks and 12 units in 8 weeks, remaining at this level for about 5 mo. The vitamin A content of the butterfat of two cows that had been producing fat containing 1 and 5 units, respectively, increased to 35 and 25 units within 2 weeks when placed on pasture. Cows were able to utilize the vitamin A and carotene of pasture grass in such a manner as to produce butterfat high in vitamin A even toward the end of lactation.

The average apparent percentage of vitamin A in feed recovered in the butterfat was 47 percent for a cow receiving 8,432 units daily, 21 percent for a cow receiving 60,189 units, and 10 percent for a cow receiving 116,101 units daily. The daily intake of 17,000 units of vitamin A was not sufficient to maintain the health of the cow. The number of units of vitamin A in the feed over mainte-

nance requirements necessary to produce 1 unit in the butterfat varied with the individual animals, but on the average amounted to 11 units.

It is concluded that in order for cows to continue to produce a butterfat high in vitamin A the feed must be extremely rich in this factor. Green growing pasture grasses appeared to be needed to maintain this production.

The relative value of irradiated yeast and irradiated ergosterol in the production of vitamin D milk, W. C. RUSSELL, D. E. WILCOX, J. WADDELL, and L. T. WILSON (*Jour. Dairy Sci.*, 17 (1934), No. 6, pp. 445-453, fig. 1).—The New Jersey Experiment Stations conducted a series of investigations in which accurately assayed irradiated yeast and solutions of irradiated ergosterol, with and without hydroquinone, were fed to cows at various intervals, and the butterfat produced was assayed for antirachitic potency.

When fed at the rate of 60,000 units per cow per day irradiated ergosterol was approximately as efficient as irradiated yeast in producing vitamin D milk with a potency of 35 to 40 units per quart. At levels of 180,000 units per cow per day irradiated yeast feeding produced milk with a potency of from 150 to 160 units per quart, while the irradiated ergosterol milk was only potent to the extent of from 120 to 130 units. Increasing the daily allowance of irradiated ergosterol to 300,000 units caused only a slight increase in the vitamin D potency of the milk. The addition of hydroquinone increased the effectiveness of irradiated ergosterol, but it exerted its greatest effect at the lower levels of feeding. In the case of both products less than 2 percent of the ingested antirachitic units appeared in the milk.

Irradiated milk: The transmission and antirachitic activation of milk films by ultraviolet radiations, G. C. SUPPLEE and M. J. DORCAS (*Jour. Dairy Sci.*, 17 (1934), No. 6, pp. 433-443, figs. 4).—Continuing the studies with irradiated milk (E. S. R., 69, p. 154), it was found that only 20 to 40 percent of the ultraviolet radiations between 2,500 and 2,850 a. u. striking the surface of the milk at right angles are transmitted by films 0.02 mm thick. Films 0.11 mm thick transmitted 5 percent or less of the radiation between these limits. As the fat percentage of the milk increased the ultraviolet transmitting properties decreased somewhat, but not in proportion to the amount of fat present. The transmission curves of certain milk derivatives of widely different character were similar to those of natural whole milks of variable fat content.

Milks and milk derivatives were more transparent to long wave ultraviolet radiation between 2,800 and 3,300 a. u. than to short wave radiations. The degree of antirachitic activation imparted to milk bore only an apparent general relationship to the fat content. Because of the opacity of milk it was necessary to use relatively high intensities of ultraviolet radiation for efficient and effective activation. It was found that extremely thin slow-moving films showed a less degree of activation after a momentary exposure than did thicker and faster moving films. It was probable that the synthesis of vitamin D by direct radiation takes place at, or substantially at, the surface of the milk.

Vitamin studies XX.—The effect of various methods of pasteurization on the vitamin B and the vitamin G content of cow's milk, R. A. DUTCHER, N. B. GUERRANT, and J. G. MCKELVEY (*Jour. Dairy Sci.*, 17 (1934), No. 6, pp. 455-466, figs. 2).—Continuing this series of studies at the Pennsylvania Experiment Station (E. S. R., 68, p. 866), this investigation was undertaken to obtain information regarding the vitamin B and G content of milk obtained from cows fed under controlled conditions. It was also planned to determine the thermostability of these vitamins when subjected to various methods of pasteurization.

Raw milk was found to contain appreciable amounts of vitamins B and G, and 3 ml per day were sufficient to furnish at least one Sherman unit of each vitamin. Vitamin B was the limiting factor when 3 ml were fed as the sole source of these vitamins, but the vitamin B potency was not as low as has been reported. The raw milk potency of these two vitamins was remarkably constant throughout the year.

The greatest loss of vitamins B and G occurred when milk was pasteurized under reduced pressure. Some loss of the vitamins occurred in all methods of pasteurization, but there was less destruction when milk was boiled for 10 min. under a reflux condenser. The maximum loss of either vitamin due to the method of pasteurization was 38 percent, and this destruction under carefully controlled plant conditions need not be so great.

The results suggested that the relative requirements for vitamins B and G by the rat vary with the age of the animal, the vitamin B requirement being greater in the young rat and the need for vitamin G increasing as the animal matures.

The effect of homogenization on certain characteristics of milk, C. J. BABCOCK (*U. S. Dept. Agr., Tech. Bul. 438 (1934), pp. 12, figs. 4*).—A series of tests was undertaken to determine the effects of homogenization on milk. It was found that pasteurized homogenized milk was as palatable to the average consumer as was pasteurized unhomogenized milk. Because of the development of rancidity in raw milk, homogenization cannot be extensively applied to this product for commercial purposes. The optimum temperature for developing rancidity in homogenized raw milk ranged from 30° to 40° C. (86° to 104° F.).

For market purposes milk should be homogenized immediately after being pasteurized or vice versa. The homogenization should be carried out at or above the pasteurizing temperature. The sediment found in homogenized milk consisted largely of leucocytes and epithelial cells, which in unhomogenized milk are carried up with the rising fat globules and held in the cream layer. To prevent this sedimentation homogenized milk should be clarified before processing.

The Babcock test for butterfat was not so high for homogenized milk as it was for the same milk before processing. Homogenization lowered slightly the specific gravity of milk, but not to an extent where it materially affects the percentage of total solids as calculated from the specific gravity.

The boiling point elevation of concentrated milk solutions, A. W. SCOTT (*Jour. Roy. Tech. Col. [Glasgow], 3 (1933), No. 1, pp. 116-120, figs. 2*).—The results of a study on the boiling point elevation of concentrated milk products are reported. It was found that with the maximum concentration of unsweetened milk used in practice the boiling point elevation was not likely to exceed 2° F. The corresponding figure for sweetened condensed milk was 6°.

A new method of converting average whole milk into soft curd milk, E. LUNDSTEDT (*Milk Plant Mo., 23 (1934), No. 7, pp. 32-34, 37, 38, 39, fig. 1*).—In this article the author describes a new method for converting average milk into soft-curd milk. The method is based upon a change in the character of the casein complex brought about by mechanical removal of lecithin from the surface of the fat globules. The active lecithin set free is then adsorbed by the casein network, where it acts as a protective colloid, preventing the milk from forming a firm coagulum and thus rendering it soft curded.

Sediment in homogenized cream, G. M. TROUT (*Michigan Sta. Quart. Bul., 17 (1934), No. 1, pp. 38-40*).—Studies were made on sedimentation in bottled cream that had been partially separated, pasteurized, and standardized to 20 percent butterfat with either whole milk or skim milk.

Clarification prevented some but not all of the sedimentation in cream so treated. Filtering cream and homogenizing resulted in less sediment than unfiltered cream but more than the clarified. There was a tendency for the leucocytes to settle out as a result of homogenization. Skim milk was more desirable from the standpoint of sediment elimination as a standardizing agent than whole milk in the homogenized product, especially at the lower pressures of homogenization. The results showed that sedimentation may occur in homogenized cream as well as in homogenized milk, and that clarification removed some but not all of the sediment.

The relation of dry skim milk to several of the physical and chemical properties of whipped cream, W. H. E. REID and W. C. ECKLES (*Missouri Sta. Res. Bul. 214* (1934), pp. 36, figs. 34).—The relative influence of dried skim milk on several of the properties of cream prior to its being whipped and subsequently were determined, and consideration was given to factors other than the serum solids-not-fat content, which also affects the production of desirable whipping cream.

It was found that adding dried skim milk to cream for whipping and then aging increased markedly the viscosity of the cream and the acidity but had little influence on the surface tension. The dried skim milk was added in the form of a cold paste. Adding dried skim milk to fluid skim milk increased its foaming ability and viscosity and slightly reduced the surface tension. Of the four different types of whippers used, the air whipper proved to be the most satisfactory.

The addition of 6 percent of dried skim milk improved cream for whipping purposes by imparting a more desirable flavor, by giving a closer, more uniform, and smoother texture, by increasing the resistance of the body and reducing the material that drained from the finished product, by imparting a more glossy desirable appearance, and by promoting a whip in some creams that would otherwise be undesirable for this purpose. The intensity of color, flavor, and fat clumping was largely due to the type of whipper used. The more pronounced the clumping, the more greasy and less desirable was the flavor in the finished product. Adding sugar before aging the cream improved the flavor of the finished product, reduced the overrun, improved the body, and decreased the amount of material that drained off.

It was concluded that pasteurized cream was satisfactory for whipping, that aging cream for 24 hr. was enough to insure proper whipping if the butterfat content was high, that 32 percent of cream was uniformly satisfactory, and that a whipping and aging temperature of 42° F. was satisfactory.

The relation of dry skim milk to several of the physical and chemical properties of cream cheese, W. H. E. REID and H. R. ALLEY (*Missouri Sta. Res. Bul. 213* (1934), pp. 40, figs. 7).—This investigation was undertaken to study the influence of dried skim milk on several of the physical and chemical properties of sweet-cream cream cheese and to determine the influence of varying percentages of fat on the quality of the cheese.

When the fat content of cheese did not exceed 25 percent the most desirable amount of dried skim milk to use was 15 to 18 percent. The development of a desirable, typical cream cheese flavor was retarded somewhat by adding more than 10 percent of dried skim milk, but the spreading, slicing, and keeping qualities of the cheese became more desirable as the dried skim milk content was increased to 18 percent. For immediate consumption an excellent cheese could be made by using 20 percent of butterfat, 18 percent of dried skim milk, and 3 percent of starter, and a highly desirable cheese was manufactured with

20 percent of butterfat, 15 percent of dried skim milk, 0.4 percent of gelatin, and 3 percent of starter.

The rate and amount of lactic acid produced depended upon the amount and quality of starter added and the composition of the mix. It was not possible to produce a desirable flavor in cheese made with 20 percent of dried skim milk, even though starter was added at the rate of 20 percent by weight. With a fat content above 25 percent the body of the cheese became more resistant, sticky, and gelatinous. A high fat content tended to submerge the desirable mild acid flavor developed by the lactic acid and gave a rich creamy flavor that became rancid more rapidly than cheese with a lower fat content. Up to 0.4 percent of gelatin appeared to be the most desirable amount to use in the cheese manufacture when the fat content was 20 to 25 percent. Higher amounts of gelatin imparted a curdled appearance to the cheese when spread and produced a spongy, very resistant, dry cheese. Increasing the homogenizing pressure from 2,000 to 3,000 lb. made the texture of the cheese closer and the body firmer, due to the increase in viscosity, surface tension, and clumping of fat.

Disturbances in the natural oxidation-reduction equilibrium of milk with special reference to the use of the dehydrated milks in the manufacture of cottage cheese, W. H. E. REID and R. L. BROCK (*Missouri Sta. Res. Bul.* 216 (1934), pp. 26, figs. 19).—This investigation was designed to study the conditions of manufacture and storage of cottage cheese made from dehydrated milks, to determine the factors detrimental to quality, and to develop possible corrections for application in the milk plant.

The natural oxidation-reduction equilibrium of fresh raw milk appeared to be well poised, but could be altered to a sensitive condition. Exposure to room temperature for 5 hr. or more decidedly changed the character of the Eh in milk. The Eh of whole milk was more stable than that of fluid skim milk. While normal pasteurization did not alter the character of the Eh of raw fluid whole milk appreciably, temperatures above 143° F. and holding periods longer than 30 min. affected the Eh in proportion to the excess processing.

The character of the Eh in reconstructed dry milk was more sensitive than that of fluid raw or pasteurized milk, and when dry milk was used in its manufacture the character of the Eh of cottage cheese was altered. Cottage cheese made with dry milk was more sensitive to oxygen, light, lactose, lactic acid, and electrolytes, with a corresponding change in its physical and chemical properties. Eh appeared to be related to the physical and chemical properties of milk and cottage cheese, and adjustment of electrolytes to more nearly that of fluid milk was accompanied by more normal chemical and physical properties. Sodium hydroxide of 0.00002 N concentration or less in reconstructed milk was more desirable than calcium compounds or higher concentrations of either sodium or calcium.

Standards and methods of analysis of dry skim milk, E. C. THOMPSON, A. H. JOHNSON, and M. KLOSER (*Jour. Dairy Sci.*, 17 (1934), No. 6, pp. 419-424).—This is the first revision of the standards for grading dried skim milk previously noted (*E. S. R.*, 64, p. 472).

The relation of the freezing procedure and the composition of the mixture to the physical and crystalline structure of ice cream, W. H. E. REID and M. W. HALES (*Missouri Sta. Res. Bul.* 215 (1934), pp. 20, figs. 11).—The mixes used in this study were so compounded as to be representative of average commercial mixes and of extremes, by using variable increments of butterfat, solids-not-fat, sugar, and gelatin. The effect of a single ingredient upon the crystalline and physical structure of the resulting ice cream was determined

by varying only one ingredient at a time. A petrographic microscope was used for identifying the crystalline and noncrystalline materials in the ice cream.

It was found that the composition of a mix materially affected the crystalline and physical structure of the ice cream. Increasing the percentage of fat, solids-not-fat, sugar, and gelatin changed the texture from a coarse condition to a fine crystalline and physical structure. The crystals shown in the microphotographs were identified as ice crystals. Fine texture in ice cream was associated with the presence of uniformly dispersed small angularly shaped ice crystals and jagged tapering air cell boundaries.

Immersion oil was superior to air as an embedding medium for studying the crystalline and physical structure of ice creams.

Low pressure steam sterilizer for milking pails on dairy farms, J. E. NICHOLAS (*Milk Dealer*, 23 (1934), No. 11, pp. 68-70, fig. 1).—In this paper from the Pennsylvania Experiment Station a "low pressure steam sterilizer" is described that can be economically operated for the sterilization of milk pails. It is possible with this equipment to obtain a temperature of 215° F. with a very small amount of water and to reach this temperature in a relatively short heating period.

VETERINARY MEDICINE

Parasitism and disease, T. SMITH (*Princeton, N. J.: Princeton Univ. Press; London: Oxford Univ. Press*, 1934, pp. XIII+196; rev. in *Arch. Path.*, 18 (1934), No. 3, pp. 456, 457).—This series of lectures on the relation between disease and parasitism in its broadest manifestations is presented under the headings of predation and parasitism, the life cycle of parasites, aberrant parasitism and incomplete cycles, the stage of conflict between host and parasite, cell parasitism and phagocytosis, variation and mutation among parasites, the survival of parasites and movement from host to host, epidemiology, and the utilization of discoveries in parasitism.

Handbook of general hematology, I, edited by H. HIRSCHFELD and A. HITTAIRE (*Handbuch der allgemeinen Hämatologie. Berlin and Wien (Vienna): Urban & Schwarzenberg*, vol. 1, 1932, pt. 1, pp. [5]+734, pls. 17, figs. 40; 1933, pt. 2, pp. [4]+735-1523, pls. 30, figs. 122; rev. in *Arch. Int. Med.*, 52 (1933), No. 5, pp. 821-825).—The 24 contributions by many authors appearing in this first volume, which is issued in two parts, are, with one exception, accompanied by extensive bibliographies. The review is by H. Downey.

Relationship of veterinary science to animal breeding and public health—legal protection of the practice of veterinary science, J. R. MOHLER (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 4, pp. 432-449).—This is the presidential address delivered at the twelfth annual International Veterinary Congress held in New York, N. Y., in August 1934 (*E. S. R.*, 71, p. 433).

Annual report of the Civil Veterinary Department, Bengal, and Bengal Veterinary College for the year 1932-33, P. J. KERR and A. D. MACGREGOR (*Civ. Vet. Dept., Bengal, and Bengal Vet. Col. Ann. Rpt.*, 1932-33, pp. 74, figs. 4).—The preventive inoculation and treatment of diseases of livestock during the year in Bengal are reported, the details of their occurrence being presented in tabular form.

[**Studies in comparative pathology, etc., in Japan**] (*Jour. Japan. Soc. Vet. Sci.*, 13 (1934), Nos. 1, pp. 1-68, pls. 5, figs. 2; 2, pp. 77-161, pls. 6).—The contributions presented (*E. S. R.*, 71, p. 96) in No. 1 include the following: A Case of Blastomycosis on Pelvic Bones of a Horse, by M. Saijo, H. Imaoka,

and Y. Yata (pp. 1-9, Eng. abs. pp. 8, 9); A Rare Case of Aneurysma Found in the Beginning Portion of Aorta in a Horse, by M. Saijo and T. Kato (pp. 10-18, Eng. abs. pp. 17, 18); The Value of Formolized Blackleg Vaccine [trans. title], by T. Konno and K. Hashimoto (pp. 19-38, Japan. abs. pp. 36-38); On the Identity between the Virus of Contagious Epithelioma of Fowls and the Vaccine Virus—I, The Gallinization of the Vaccine Virus through Fowl Passage, by T. Matsumura (pp. 39-50, Eng. abs. pp. 49, 50); and A New Apparatus for the Simple Cultivation of Anaerobic Microorganisms and Some Experiments concerning Its Practical Application, by Y. Tsuji (pp. 51-68, Eng. abs. pp. 66-68).

The contributions presented in No. 2 include the following: On the *Salmonella* Infection among Foxes and Dog, by S. Watanabe (pp. 77-91, Eng. abs. pp. 90, 91); On the Identity between the Virus of Contagious Epithelioma of Fowls and the Vaccine Virus—II, The Vaccination of the Epithelioma Virus through Rabbit Passage, by T. Matsumura (pp. 92-104, Eng. abs. pp. 103, 104) (see above); On the Identity between the Virus of Contagious Epithelioma of Fowls and the Vaccine Virus—III, Reversion of the Modified Vira to the Original Ones, IV, Comparison of Pathogenicity among Vaccine, Epithelioma, Gallinized Vaccine, and Vaccinized Epithelioma Vira, and V, Conclusion, by T. Matsumura (pp. 105-117, Eng. abs. pp. 115-117); Pathological Studies of Rinderpest—Report I, The Histological Changes in the Liver, by T. Fukushima (pp. 118-138, Eng. abs. pp. 135, 136); and A Rare Anomaly of the Kidney of the Horse [trans. title], by O. Emoto and S. Yamamoto (pp. 139-142, Japan. abs. p. 142).

A study of twelve strains of *Bacillus necrophorus*, with observations on the oxygen intolerance of the organism, W. I. B. BEVERIDGE (*Jour. Path. and Bact.*, 38 (1934), No. 3, pp. 467-491).—The author briefly reviews the literature in connection with a list of 56 references, and reports upon morphological, cultural, and biochemical studies of 12 strains of *B. necrophorus*, 6 isolated from abscesses in bovine livers and 6 from cases of "jaw disease" in kangaroos and wallabies. Sufficient similarity was shown by all strains to justify their grouping as a single species, there being no evidence of host-specific strains.

Enterotoxaemia in herbivorous animals—its possible bearing on grass sickness in horses, W. S. GORDON (*Vet. Rec.*, 14 (1934), No. 34, pp. 1016-1027).—Filtrates that were prepared from the intestinal contents of lambs, sheep, and horses which died after an acute illness under circumstances suggestive of a toxemia were shown to contain a toxin lethal to mice when injected intravenously. This toxin is neutralized by antiserum prepared from *Bacillus ovitoxicus* (Bennetts) and *B. welchii* (Wilsdon type "D"). Among some of the recognized clinical conditions in which this toxin has been detected there may be included certain cases of lamb dysentery, grass ill, a braxylike disease in lambs and older sheep, a toxemic condition in pregnant ewes, and grass sickness in horses.

Laboratory and field methods for the detection of mastitis, II, J. M. ROSELL (*Canad. Pub. Health Jour.*, 25 (1934), No. 4, pp. 180-184).—This second contribution (E. S. R., 71, p. 845) deals briefly with the bacteriology of chronic streptococcal mastitis. *Streptococcus mastitidis* (*agalactiae*) is said to be responsible for 95 percent of the ordinary forms on both the European and American Continents.

Relapsing fever in Texas.—IV, *Ornithodoros turicata* Duges, a vector of the disease, H. A. KEMP, W. H. MOURSUND, and H. E. WRIGHT (*Amer. Jour. Trop. Med.*, 14 (1934), No. 5, pp. 479-487).—In continuation of their studies (E. S. R., 71, p. 530) the authors found *O. turicata* to be a common vector of relapsing fever in Texas. It has a fairly wide distribution over the State, but is more common in the south central part, where it is found in sandy caves.

The life history does not appear to differ very much from that of other members of the same genus.

"Once infected, the tick remains so for life. All stages are infective, and infection may be produced merely by the act of biting. As indicated by Wolbach's studies on *Borrelia duttoni* and *B. kochi* in *O. moubata* [E. S. R., 31, p. 81], ingested spirochetes make their way very quickly to practically every organ of the body. The large numbers found in connective tissue seem to indicate multiplication without, possibly, any definite cycle of development. Infection may be hereditary in this tick. *O. turicata* and the relapsing fever spirochete of Texas appear to be rather closely adapted one to the other."

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—I, The effect of urine on the eggs and larvae in the feces, I. W. PARNELL (*Canad. Jour. Res.*, 10 (1934), No. 5, pp. 532-538).—The author finds that "the addition of urine, even when diluted with 25 percent of water, to both horse and sheep feces, proves to be lethal to the eggs and larvae of all the bursate nematodes in as short a time as 24 hr. Higher dilutions kill a large proportion of eggs and larvae in the same time, and the use of this agent is suggested as being of probable practical value in the control of these parasites."

The development of the trichostrongyle, *Nippostrongylus muris*, in rats following ingestion of larvae, B. SCHWARTZ and J. E. ALICATA (*Jour. Wash. Acad. Sci.*, 24 (1934), No. 8, pp. 334-338).—The authors find that *N. muris* passes through three distinct developmental phases in the course of its life cycle, namely, (1) the free-living stage, involving one ecdysis, following which the worms emerge as second-stage infective larvae; (2) the pulmonary parasitic stage, in the course of which the larvae develop to the third stage and finally to the fourth stage, the latter stage preceded by an ecdysis; and (3) the intestinal parasitic stage in the course of which the larvae grow to the fifth or final stage, preceded by a third ecdysis, followed subsequently by the development of the worms to fertile maturity.

Skrjabinema oreanni sp. nov., a nematode parasite of *Oreamnos americanus* and *Rangifer* sp. in Canada, W. E. SWALES (*Canad. Jour. Res.*, 10 (1934), No. 5, pp. 527-531, figs. 11).—The author here records an oxyurid nematode of the genus *Skrjabinema* from the Columbian mountain goat and mountain caribou in Canada. This parasite is the first Canadian and second North American record for the genus and is described as a new species. A key to the species of *Skrjabinema* is included.

Certain poisonous plants of Wyoming activated by selenium and their association with respect to soil types, O. A. BEATH, J. H. DRAIZE, H. F. EPPSON, C. S. GILBERT, and O. C. MCCREARY (*Jour. Amer. Pharm. Assoc.*, 23 (1934), No. 2, pp. 94-97).—In reporting upon a further study of the poisonous properties of the two-grooved milk vetch (E. S. R., 67, p. 738), it is stated that *Astragalus bisulcatus* plants yielding a decidedly offensive odor are more toxic than plants of this species lacking in this characteristic. The only variable factor contributing to this difference so far determined is the presence of selenium.

In work in cooperation with the State geologist, S. H. Knight, and his staff, a correlation was made of some range plants bearing selenium with the geological formation upon which the plants grow. "Three species of astragali, *A. bisulcatus*, *A. grayi*, and *A. pectinatus*, *Xylorrhiza parryi*, *Oonopsis condensata*, *Stanleya bipinnata*, and *Mentzelia decapetala* represent at this point in our investigations definite indicator plants that have shown the constant presence of selenium when collected on one or more of the following formations: Niobrara,

Steele, Pierre, Morrison, Wasatch (as represented by Cooper Basin), Benton, Hilliard-Cody, Lewis, Bridger, and the dark band of the Dakota. These formations are mostly shale. The so-called indicator plants are the richest in selenium when they occur on the undecomposed shale. The element selenium is distributed throughout the entire make-up of these plants. The amount in the aboveground portion of a plant exceeds that found in the root system and quantitatively varies from a trace to a tenth of one percent selenium (air-dry basis). Poisonous range plants containing selenium occurring on the Niobrara, Steele, or Pierre shales are more poisonous to livestock, on the average, than the same plants found on the other formations listed above."

It is known that *A. bisulcatus* free from selenium is poisonous to livestock, although very much less so, as brought out in this experimental work. It appears that the toxic principles of 5 out of 7 of the selenium-bearing range plants (*A. bisulcatus*, *A. grayi*, *A. pectinatus*, *O. condensata*, and *X. parryi*) may be extracted freely from water. Similar data for *S. bipinnata* and *M. decapetala* have not been obtained. Native grasses growing in close proximity to type selenium-bearing range plants were found poisonous to guinea pigs when these pigs were allowed to feed on such areas. *Vicia linearis*, *Thermopsis divaricarpa*, *Solidago mollis*, *Melilotus* sp., *Iris missouriensis*, *Juncus balticus*, and some native grasses represent a partial list of plants that have been found to contain selenium which were apparently influenced by those plants yielding soluble selenium compounds. A partial list is given of 20 representative plants collected on well-defined shales found to be negative for selenium.

The acute and chronic forms of poisoning here described are said to be responsible for heavy livestock losses in Wyoming. "There appear to be several manifestations of selenium poisoning of livestock. Livestock grazing upon selenium-bearing plants may exhibit slightly different types of poisoning, depending upon the species of such plant ingested. Since such variations do occur, it would seem evident that one of two conditions applies. First, the various selenium-bearing plants may carry the element in different chemical combinations, or, second, the selenium may be present in all plants in a similar chemical combination but the presence of other toxic substances may account for variations in the manifestations of poisoning."

The form of selenium poisoning recently described by Nelson, Hurd-Karrer, and Robinson (E. S. R., 70, p. 208) appears to be quite different from that noted with the selenium-bearing range plants of Wyoming.

Report on a preliminary field survey of the so-called "alkali disease" of livestock, K. W. FRANKE, T. D. RICE, A. G. JOHNSON, and H. W. SCHOENING (U. S. Dept. Agr. Circ. 320 (1934), pp. 10, figs. 7).—This is a report of work relating to an affection of livestock met with for a number of years in certain areas of the north-central Great Plains which has been referred to as "alkali disease." Although the specific cause is not known, it is evident that either grain or forage grown in certain areas may cause the disease. The possibility that it might be caused by traces of selenium absorbed by the plants was suggested by H. G. Knight as early as May 1931. The present circular is restricted to a historical summary and the results of a field survey made in July and August 1931 through the central and southwestern parts of South Dakota, parts of northern Nebraska, and the eastern edge of Wyoming by the South Dakota Experiment Station and the U. S. Department of Agriculture, cooperating. The malady was found locally in these areas on horses, cattle, swine, and poultry. It was also reported on mules. Very few sheep were found in the

affected territory, and no dependable information was obtained as to their susceptibility.

The survey has shown that the "toxicity of the grains and grasses grown in some locations is greater than the toxicity of those grown in other locations; also there seem to be variations from season to season. Therefore losses vary with the degree of toxicity of grains and grasses under any given set of conditions. Where the disease is severe, considerable livestock may die or have to be killed, and eggs cannot be used for hatching purposes. In such localities the raising of hogs or poultry, or both, and even cattle, has been discontinued, and tractor farming of small grain for the market is the sole substitute. Such grain, known to have been produced on affected soil, brings only minimum prices. In two specific cases noted in 1931 the so-called "alkalied" grain brought only half the price of good grain from unaffected farms. Likewise, affected animals usually bring only minimum prices when marketed. Horses that are so severely alkalied as to lose their hoofs cannot be worked for months, during which time they require special care. In some cases they become repeatedly alkalied, so that they cannot be worked for a year or more. Owners of some badly affected farms have abandoned them, chiefly on account of this trouble, not being able to finance, lease, or sell them. In many cases new renters of affected farms, unfamiliar with the conditions, have had heavy losses within a year after moving to such farms.

"At present the only control measures known are: (1) Affected animals should be transferred to feed on unaffected areas; (2) alkalied grain, hay, or grass should not be used for feed or pasture; (3) areas definitely known to produce alkalied grain and forage should not be used for the production of grains or forage; and (4) suspected areas should be carefully studied as promptly as possible to determine definitely whether or not they produce toxic grain and forage."

Remedies for cyanide poisoning in sheep and cattle, A. B. CLAWSON, H. BUNYEA, and J. F. COUCH (*Jour. Wash. Acad. Sci.*, 24 (1934), No. 9, pp. 369-385).—The results of experiments with sheep and cattle conducted with a view to determining the relative efficiency, under practical conditions, of several substances that have been suggested as remedies for cyanide poisoning, namely, methylene blue, sodium tetrathionate, sodium thiosulfate, sodium nitrite, and a combination of the two latter, are reported. "The animals were given drenches of potassium cyanide in water, and the remedies were given at various times after the cyanide was administered. Except for two sheep for which the remedy was mixed with the cyanide and administered as a drench, the remedies were injected intraperitoneally and in the cattle they were injected into the jugular vein. All of the substances tried offered some protection against the poisonous action of the cyanide.

"The minimum lethal dose of hydrocyanic acid, administered as potassium cyanide in a drench, was determined to be for sheep 2.315 mg per kilo, for cattle nearly 2.042 mg per kilo. The minimum toxic dose was found to be for sheep 0.992 mg per kilo and for cattle somewhat less than 0.882 mg per kilo.

"In the experimental work with sheep 50 cc of methylene blue protected against 1.42 lethal doses of cyanide, although 30 cc failed to do so. Of the other remedies tried, sodium tetrathionate and sodium nitrite, each protected against 1.42 m. l. ds. but failed to do so against slightly larger doses. Sodium thiosulfate protected against 1.62 m. l. ds. The combination of sodium thiosulfate and sodium nitrite was not tried with sheep.

"In the cattle experiments sodium nitrite protected against a single minimum lethal dose of cyanide but failed to do so when 1.5 m. l. ds. had been given.

Sodium thiosulfate protected against 1.39 m. l. ds. With cattle the best results were obtained with a combination of sodium nitrite and sodium thiosulfate which protected against 2 m. l. ds. Methylene blue and sodium tetrathionate were not used with poisoned cattle.

"The results strongly indicate that in administering any of the substances tried as remedies it is of the utmost importance that they be given very promptly after symptoms of poisoning develop and before the period of respiratory paralysis sets in."

Possibility of the simultaneous diagnosis of tuberculosis and infectious abortion of bovines by allergic reactions [trans title], C. DUBOIS (*Compt. Rend. Soc. Biol. [Paris]*, 115 (1934), No. 10, pp. 1065-1068).—Of 103 bovines to which the intradermal tuberculin and abortin tests were administered simultaneously, 17 reacted to tuberculin only, 15 to abortin only, and 12 to both antigens. Of the 12 animals that reacted to both antigens, all showed lesions of tuberculosis at autopsy and 3 reacted positively to the agglutination test for infectious abortion. The abortin test was found to be much more sensitive than the serum agglutination test.

The findings are considered to have demonstrated that the two infections can be simultaneously diagnosed in this way. From a practical standpoint, the region of the caudal folds is considered the best for injection of the antigens.

A new Bartonella of the bovine, B. bovis n. sp. [trans. title], A. DONATIEN and F. LESTOQUARD (*Bul. Soc. Path. Exot.*, 27 (1934), No. 7, pp. 652-654).—The authors describe a new *Bartonella* from the bovine, for which the name *B. bovis* is proposed. As high as 20 percent of the erythrocytes may be parasitized, but no clinical symptom appears.

Economic Advisory Council Committee on Cattle Diseases report, F. G. HOPKINS ET AL. ([*Gt. Brit.*] *Econ. Advisory Council, Com. Cattle Diseases Rpt.*, 1934, pp. 161).—This is the report of a Committee on Cattle Diseases consisting of seven members appointed by the British Prime Minister on November 2, 1932, "to consider what practical measures can be taken to secure a reduction of disease among milch cattle in this country, and to report upon any changes desirable in the existing administrative practice and, in particular, upon the value and practicability of methods for reducing the incidence of bovine tuberculosis and improving the milk supply."

Following a brief introduction, part 1 deals with the production and distribution of milk and their relation to cattle diseases and public health (pp. 9-48); part 2 with possible lines of administrative development, including the further development of the veterinary inspection of dairy cattle, methods of eradication, the pasteurization of milk, and the interrelation of the various policies advocated (pp. 49-66); and part 3 with recommendations, including administrative changes and the financial effect of the measures recommended (pp. 67-86). Part 4 consists of a summary of principal conclusions and recommendations (pp. 87-98). Among the subjects dealt with in the 13 appendixes are the average life of dairy cows (pp. 113-118), the estimated loss to the farming industry from cattle diseases (pp. 118-120), the percentage wastage of dairy cattle according to the proportion of homebred cows entering the herd (p. 121), milk-borne epidemics reported in the United Kingdom since the beginning of the twentieth century (pp. 124-130), bibliographical references to papers referred to in the section of the report dealing with the effect of pasteurization on the constituents of milk (p. 131), returns prepared by the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland, showing the extent to which veterinary inspection of dairy cattle is undertaken by local authorities (pp. 132-141), certain particulars of legislation relating to cattle

diseases and the milk supply in the United States, Canada, Denmark, Netherlands, Germany, and Norway (pp. 143-152), numbers of infected milk samples in county boroughs drawing supplies of milk from the West Riding of Yorkshire (p. 153), and an example of rules drawn up for the management of a herd in which an attempt is being made to eradicate bovine tuberculosis (pp. 154-157).

"The incidence of bovine tuberculosis among cows is probably as high in Great Britain as anywhere else in the world. Cattle may be shown to be infected with it by their reactions to tests with tuberculin. At least 40 percent of cows are infected with it in such degree that they will react to the tuberculin test. . . . Cattle are probably infected with contagious abortion in as great numbers as with tuberculosis. . . . The incidence of Johne's disease varies greatly throughout the country. In some districts it is increasing and is causing considerable anxiety. . . . Thirty percent of the milking cattle in this country are probably infected with mastitis other than tubercular mastitis. Chronic streptococcal mastitis is responsible for 90 percent of the cases. . . . Bovine tuberculosis is responsible for over 2,500 deaths annually among the human population in Great Britain and for a still greater amount of serious illness. Most bovine tuberculosis in human beings is attributable to milk. At least 5 cows in every 1,000 yield milk infected with tuberculosis. As the result of the mixing of such milk with pure milk, over 5 percent of samples from individual herds are infected. A very much larger percentage of the milk conveyed in large containers is infected. . . . Undulant fever, the disease associated with contagious abortion in cattle, is very rarely reported in Great Britain, though possibly the disease often passes unrecognized. . . . Approximately 100 outbreaks of epidemic disease attributable either to mastitis among cattle or to subsequent infection of milk by those handling it have been recorded in this country since 1903."

Field reports of cattle losses in North Dakota due to arrow grass, J. W. ROBINSON and T. O. BRANDENBURG (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 4, pp. 458, 459).—A brief report is made of losses of cattle in North Dakota resulting from feeding upon arrowgrass (*Triglochin maritima*). It is considered probable that cattle eat little of this grass when other forage is available, but when due to the drought other grasses were scarce a lethal amount was consumed. An excessive rainfall which followed a severe drought period caused the rapid and luxuriant growth of this plant and the production of a large amount of hydrocyanic acid.

Some notes on the treatment of anaplasmosis with novarsenobillon, R. B. H. MURRAY (*Vet. Rec.*, 14 (1934), No. 30, pp. 854, 855).—The intravenous injection of 1.8 g of novarsenobillon dissolved in distilled water is said to have resulted in an uneventful recovery of a 2-year-old Ayrshire bull suffering from anaplasmosis due to *Anaplasma marginale*. Later 7 calves that were treated as they became naturally infected recovered after treatment, while 6 left untreated succumbed.

Bang's disease of cattle [trans. title], G. FINZI (*Proflassi*, 7 (1934), No. 8, pp. 281-288; *Fr., Eng. abs.*, pp. 287, 288).—A discussion of the relative value of the several diagnostic measures and of chemo- and vaccino-therapy.

Results of compulsory tests for Bang's disease, B. J. KILLHAM (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 1, pp. 44-47; also in *Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 664-668).—This contribution reports upon the results of tests for infectious abortion in cows supplying milk to the city of Jackson, Mich., where an ordinance requiring such tests became effective in the fall of 1933. In the course of this work 4,382 animals over 1 yr. of age in

294 herds in 18 of the 19 townships in Jackson County were given the agglutination test, of which 10.7 percent of the animals were positive reactors and 6.7 percent suspects. Of the herds tested, 44.2 contained positive reactors and 17.7 suspects. In comparing these results with those obtained by Fitch and Donham in 2 Minnesota townships (E. S. R., 71, p. 99), it is pointed out that much of the difference in the 2 States could probably be attributed to the fact that in Jackson County in many instances the younger cattle, which usually show a lighter infection, were not included in the test.

Some field experiences in the control of contagious abortion in cattle with the use of a commercial dead vaccine, W. S. LORNIÉ (Vet. Rec., 14 (1934), No. 33, pp. 927-930).—The experiments here reported led the author to consider the dead organism to be a satisfactory means for immunizing against Bang's disease.

Infectious bovine mastitis.—II, The streptococci of chronic bovine mastitis, W. N. PLASTRIDGE, E. O. ANDERSON, G. D. BRIGHAM, and E. H. SPAULDING ([Connecticut] Storrs Sta. Bul. 195 (1934), pp. 19, fig. 1).—This second of a series of bulletins on infectious bovine mastitis (E. S. R., 70, p. 386) relates to the etiological significance of different types of streptococci found in freshly drawn milk samples. Data are presented on the characteristics of the streptococci isolated from bovine udders, the details being given in tabular form and the findings correlated with laboratory evidence of mastitis preceding and following the time of making the isolation.

“Of 208 strains of udder streptococci isolated from cases of chronic bovine mastitis, 204 were divided into two principal groups on the basis of biochemical differences. Eighty-seven percent of the strains studied fell into a single group designated as group A, which possessed the properties usually attributed to *S. [treptococcus] mastitidis* (*S. agalactiae*). This group could be further subdivided into six subgroups on the basis of ability to ferment glycerol, trehalose, and salicin. However, repeat tests on strains kept in the laboratory, and tests made on several isolations from the same quarter, showed that reactions given by these substances may be subject to great variation. Excluding the results obtained with glycerol, trehalose, and salicin, the data presented indicate that streptococci of the group A type represent a well-defined group of organisms which are distinct from the saprophytic streptococci of bovine origin.

“Eleven percent of the strains studied were placed in a second group (group B). These strains differed markedly from those in group A, both in respect to biochemical reactions and in their ability to become permanently established in the bovine udder.

“The relation of the different groups of udder streptococci to other laboratory evidence of mastitis and duration of udder infection is discussed. A plan is presented for facilitating the separation of the organisms found to be associated with chronic bovine mastitis into groups A and B, and for differentiating these strains from fecal, skin, and oral strains of bovine origin. The data presented show that strains placed in group A were associated with chronic mastitis of long duration, and that strains placed in group B were associated with a mild form of chronic mastitis of relatively short duration.”

The authors emphasize the fact that the data which they present and those of others, references to which are given, show that the streptococci most commonly found to be associated with chronic bovine mastitis do not ferment raffinose and inulin, as reported for *S. mastitidis* in Bergey's Manual of Determinative Bacteriology (E. S. R., 71, p. 28), and suggest that the term *S. mastitidis* be limited to streptococci possessing the characteristics of their group A.

The morphology, culture, isolation, and immunity studies of *Actinomyces necrophorus* in calf diphtheria, L. H. SCRIVNER and A. M. LEE (*Jour. Colo.-Wyo. Acad. Sci.*, 1 (1934), No. 6, pp. 53, 54).—Contributing from the Wyoming Experiment Station the authors describe a new method for the isolation of *A. necrophorus*, a more detailed account of which has been noted (E. S. R., 72, p. 104).

Contribution to the study of the piroplasmoses of sheep.—First observation of anaplasmosis in France [trans. title], CUILLÉ, CHELLE, and CAZAUX (*Rev. Gén. Méd. Vét.*, 43 (1934), No. 507, pp. 129–141, fig. 1).—In addition to the occurrence of babesiosis of sheep in France, reported by Cuillé and his associates in 1930 for the first time in that country, the authors record the occurrence of anaplasmosis. This disease, which has been observed for many years in the southwest of France, particularly in the Departments of Aude and Haute-Garonne, corresponds to the affection observed as early as 1834 and referred to in veterinary literature under the name of jaundice or hemorrhagic icterus. It was first observed in November 1927 in a flock near Trèbes, in Aude.

A list is given of 24 references to the literature.

Tuberculosis in a goat, C. P. BISHOP, M. F. BARNES, and J. B. REIDY (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 4, pp. 457, 458).—A report of an instance in which an infected goat purchased by the owner and given access to the barn and yard in which a herd of tuberculosis-free cattle were maintained resulted in 13 of 17 head reacting within 6 mo., and following replacements from negative herds 15 of 17 reacted at the 60-day retest.

Equine encephalomyelitis, R. A. KELSER (*Vet. Alumni Quart. [Ohio State Univ.]*, 22 (1934), No. 2, pp. 45–51).—A practical summary of information on this disease.

Fluke disease in northern Manitoba sledge dogs, J. A. ALLEN and R. A. WARDLE (*Canad. Jour. Res.*, 10 (1934), No. 4, pp. 404–408, pl. 1).—An opisthorchiid trematode, *Parametorchis manitobensis* n. sp., is recorded from the livers of sledge dogs in northern Manitoba, in which it produces chronic cirrhosis and anemia, followed by muscular weakness and death. Infestation with this fluke is believed to be contracted by ingestion of metacercariae in *Catostomus commersonii*, and prophylaxis would consist of the thorough boiling of such fish before use as dog food. A key to the known species of this genus of flukes is included.

Rabbit pox, I, II, H. S. N. GREENE (*Jour. Expt. Med.*, 60 (1934), No. 4, pp. 427–440, pls. 3; 441–455, pls. 3).—The first part of this contribution deals with the clinical manifestations and course of the disease, the second part with the pathology of the epidemic disease as it appeared in a colony of rabbits in December 1932. A brief summary of the outstanding features of the disease has been noted (E. S. R., 70, p. 393).

Studies on Cestoda of poultry found in and around Douglas County, Kansas, Q. B. FERRY (*Amer. Midland Nat.*, 15 (1934), No. 5, pp. 586–594, pls. 3).—In a study conducted in and around Douglas County, Kans., for the determination of the species and extent of tapeworm infestation of the common fowl, 62 percent of those examined were found infested by *Railletina cesticillus*. "The number per fowl was fairly constant, except in two extreme cases in which one had 235 worms and the other had 334. Three species of cestodes, *Amoebotaenia sphenoides*, *Choanotaenia infundibuliformis*, and *R. echinobothrida*, appear to be uncommon parasites of domestic chickens of this region. The first was found in 4 percent of the fowls, the second in 2 percent, and the third in 4 percent. Thirty-eight percent of the chickens were parasitized by

R. tetragona. The threadlike tapeworm *Hymenolepis carioca*, which infested 40 percent of the chickens, and *A. sphenoides* were localized in the duodenum."

A list is given of 22 references to the literature.

The diseases of poultry in Greece [trans. title], M. STYLIANOPOULOS and G. DEBONÉRA (*Rev. Gén. Méd. Vét.*, 43 (1934), No. 508, pp. 193-212).—This summary of information on the diseases of poultry in Greece records the more important affections in the order of importance as fowl cholera, pullorum disease, spirochetosis, fowl pox (epithelioma contagiosa), fowl typhoid, infectious coryza, and parasitism and the paralytic affections.

Cross-species transmission studies with different strains of bird-pox, V. IRONS (*Amer. Jour. Hyg.*, 20 (1934), No. 2, pp. 329-351).—The results of a comparative study of the behavior of nine strains of bird pox, in which tests were made over a period of 4 yr. and involving more than 1,400 animals, are described.

"The virus of pigeon pox gave mild infections in the chicken. Its virulence for chickens was greatly enhanced on passage in the chicken. After a single passage in the chicken the virus of pigeon pox was greatly attenuated for the pigeon. Repeated passage of the virus of pigeon pox in the chicken with one possible exception failed to destroy the infectivity for the pigeon. One strain of fowl-pox virus was transmissible with gradually increasing virulence in the pigeon, but was temporarily attenuated for the chicken. Two other strains of fowl-pox virus were noninfectious for the pigeon. Very weak virucidal substances were rarely demonstrable in the sera of hyperimmunized birds. We were unable to distinguish different immunological strains of bird-pox virus. The chicken was susceptible but the pigeon was refractory to experimental turkey pox. The turkey was susceptible to experimental fowl pox.

"Ducks, guinea fowls, starlings, and several other species were refractory to our strains of bird pox. One strain of bird pox, virus G of pigeon pox, proved infectious for the English sparrow and certain related species. Aside from their severity, the lesions in the English sparrow were not essentially different from those encountered in the pigeon and chicken. Aside from differential infectiousness, virus G was indistinguishable from other strains. Bird-pox virus was not pathogenic for small laboratory mammals. Repeated attempts to infect the fetal rabbit by placental passage failed. While the chicken was susceptible to our strains of vaccine virus, pigeons and English sparrows were refractory.

"The lesions of vaccinia and of bird pox could readily be distinguished on the chicken by the inclusion bodies. The vaccinia lesion was not altered essentially by repeated passage of vaccine virus in the chicken. Vaccinia and fowl pox failed to give cross-immunity on the chicken. The virus of vaccinia and that of fowl pox filtered inconstantly with comparable difficulty when each was present in like amounts in the same menstrem. The strains of bird-pox viruses showed a closer relation between themselves than did any one of them to the vaccine virus."

A list is given of 36 references to the literature.

A report of some investigations of infectious laryngotracheitis, C. A. BRANDLY and L. D. BUSHNELL (*Poultry Sci.*, 13 (1934), No. 4, pp. 212-217).—In the studies at the Kansas Experiment Station here reported, the virus of infectious laryngotracheitis "could not be demonstrated on the surface of eggs laid by a flock during an active outbreak of the disease nor on eggs from a flock harboring 'carriers.' Artificially contaminated eggs may carry virus for varying periods of time, depending to some extent on the temperature at which they are stored. The etiological agent of infectious laryngotracheitis may pass through V and N Berkefeld filters in a large majority of cases when a proper

suspending vehicle is employed. A loss of potency of virus suspensions of from 10 to 100 times was demonstrated as a result of V and N Berkefeld filtration. The addition of testicular extract to infectious laryngotracheitis virus does not bring about infection when administered intravenously in the guinea fowl, duck, pigeon, white rat, or guinea pig. Serial passage of the virus of infectious laryngotracheitis through baby chicks does not decrease its virulence for mature birds."

Infectious laryngotracheitis vaccination, C. S. GIBBS (*Massachusetts Sta. Bul.* 311 (1934), pp. 20, figs. 2).—In continuation of the author's studies of infectious laryngotracheitis (*E. S. R.*, 69, p. 862), a report is given of laboratory and field experiments relating to the production of immunity through vaccination. It is pointed out that the success of vaccination against the disease depends upon the number of "takes." The most favorable time for reading takes was found to be the fourth and fifth days after vaccination. Takes may be classified, according to the degree of information, as poor, fair, good, or excellent. Occasionally takes occur in the bursa of Fabricius which are not visible at the time of examining the live birds.

"It has been determined that 94 percent takes in chickens 1 to 3 mo. of age, 97 percent takes in pullets and cockerels 4 to 7 mo. old, and 90 percent takes in hens and roosters 8 to 12 mo. of age insure a satisfactory degree of immunity for a flock as a whole. The takes should be good, fair, or excellent, for the immunity tends to wear off in birds showing poor takes. When vaccinating is once started it should be pushed on to completion with as little delay as possible in order to avoid outbreaks of the disease. After this laboratory information had been obtained, field vaccination was successfully accomplished in 6 flocks, or 11,204 birds.

"A study of disease simulating infectious laryngotracheitis was made for differential diagnostic purposes, and it was found that autogenous vaccines were specific for infectious laryngotracheitis, coryza, and rhinosinusitis, but not for each other. Therefore, it cannot be emphasized too strongly that before vaccination is resorted to for the control of infectious laryngotracheitis a correct diagnosis of the disease or diseases infecting the flock is necessary for success.

"Since laboratory vaccines for infectious laryngotracheitis have not been entirely successful in the hands of poultrymen, autogenous vaccines may have some use because of their specificity and availability at the time of greatest need. A method of preparing and using autogenous vaccines in infectious laryngotracheitis is outlined. It should be understood that this method of vaccination will save the flock if properly applied, but it cannot be depended upon to eliminate carriers, and for the good of the poultry industry as a whole it should be followed by the complete eradication and sanitary control of the disease. Vaccination for infectious laryngotracheitis merely enables the poultryman to choose the time for disposing of his birds and cleaning and disinfecting the premises occupied by them. When accepted in this light vaccination is a valuable contribution to the control of infectious laryngotracheitis."

Immunization against infectious laryngotracheitis of chickens by "in-trabursal" injection of virus, J. R. BEACH, O. W. SCHALM, and R. E. LUBBEHUSEN (*Poultry Sci.*, 13 (1934), No. 4, pp. 218-226, figs. 5).—The findings of Beaudette and Hudson on immunization against infectious laryngotracheitis (*E. S. R.*, 69, p. 279) have been confirmed by the authors.

"A vaccination procedure consisting of the application to the cloacal mucous membrane by means of a brush or swab of a glycerine suspension of virus has varied greatly in its effectiveness in the establishment of cloacal infection or 'takes.' This variability has in some cases appeared to be related to the age

of the chickens, in some to the virulence or concentration of the virus in the glycerine suspension, but more often to the method of application of the virus. The conclusion was reached that virus applied to the surface of the cloacal mucous membrane became exposed to presumably unfavorable influence of the cloacal discharges which might, and in many cases did, cause its destruction or removal before the infection had become established in the tissues.

"Vaccination by injection of virus suspension directly into the bursa of Fabricius with a hypodermic syringe was tried in comparison with application of virus to the cloacal mucous membrane with a brush and was found to be a more certain means of establishing cloacal infection. The general character of the reaction in the tissues or of the take was essentially the same for both methods. . . . It was found that an intrabursal injection can be easily made and is a practical method of vaccination for use on poultry farms.

"It is believed that, in the application of cloacal or bursal vaccination to the control of laryngotracheitis on poultry farms, the precautionary practice of examining the fowls on the fifth day for the purpose of detecting and revaccinating those which do not exhibit a take should be a regular part of the vaccination procedure.

"Satisfactory results in intrabursal vaccination were obtained by using a 1-500 dilution of desiccated virus which would produce infection when 0.1 cc of 1-5,000 or 1-10,000 dilution was injected intratracheally. Virus of lower virulence gave less satisfactory results, especially with respect to the production of visible takes.

"Twenty-eight fowls taken from vaccinated flocks at various times from 64 to 300 days after vaccination have been refractory to exposure to laryngotracheitis virus by intratracheal inoculation. In the flocks in poultry districts in which laryngotracheitis is endemic that have been vaccinated with the production of takes in 80 percent or more of the fowls, a negligible number of cases of the disease has been seen during the six months to a year that has elapsed since they were vaccinated.

"The absence of laryngotracheitis among 125 normal chickens that were added to a flock a month after it had been vaccinated and have been there for 10 mo. is regarded as evidence that cloacal vaccination does not cause fowls to become carriers of the virus."

Find cause of leukemia in poultry, R. FULGHUM (*Fla. Grower*, 42 (1934), No. 6, p. 8, fig. 1).—This contribution relating to work at the Florida Experiment Station supplements the account by M. W. Emmel, previously noted (*E. S. R.*, 71, p. 704).

Observations on fungal pneumonia in the domestic fowl, A. Z. BAKER, J. COURTENAY-DUNN, and M. D. WRIGHT (*Vet. Jour.*, 90 (1934), No. 9, pp. 385-389, pls. 4).—The authors report upon the post-mortem findings in examinations of fowls of all ages made during the course of more than 100 outbreaks of pneumonia in various parts of England and Wales.

Agglutination tests for the detection of pullorum disease of fowls, J. BIELY and E. A. LLOYD (*Vet. Rec.*, 14 (1934), No. 31, pp. 878-882).—This review of the subject is presented with a list of 14 references to the literature.

The diagnostic value of the various tests for pullorum disease, W. A. HIGGINS and C. H. SCHROEDER (*Poultry Sci.*, 13 (1934), No. 4, pp. 239-241).—In the authors' studies, the details of which are summarized in tabular form, "very close, but not quite complete, agreement was attained between the results from the tube agglutination test as compared with the rapid, whole-blood test with four of the five stained antigens in this test. Excepting the one lot of stained antigen which produced results at marked variance, the rapid, whole-

blood test with stained antigen was of equal diagnostic value as the tube agglutination test for *S[almonella] pullorum*."

Effects of different brooding temperatures on pullorum disease, W. L. MALLMANN (*Vet. Med.*, 29 (1934), No. 6, pp. 254, 255).—The author found the loss of chicks from pullorum disease in infected and mixed lots to be six or seven times as high in chicks brooded at 72° F. as in those brooded at 96°. The transmission of the disease from the infected to the uninfected stock was much higher at the unfavorable temperatures of brooding. The information obtained is considered to emphasize the extent to which unfavorable conditions lower the vitality of chicks and render them more susceptible to pullorum disease.

A study of egg-production, fertility, and hatchability of a flock of turkeys with cecums occluded, C. F. SCHLOTTHAUER, F. C. MANN, and H. E. ESSEX (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 4, pp. 455-457).—The authors have found that the occlusion of the ceca of turkeys apparently does not affect egg production, fertility, or hatchability.

***Cochlosoma rostratum* sp. nov.**, an intestinal flagellate of domesticated ducks, G. G. KIMURA (*Amer. Micros. Soc. Trans.*, 53 (1934), No. 2, pp. 102-114, pl. 1, figs. 6).—This contribution reports upon a study made of *C. rostratum*, which appears to be wide-spread among domestic duck, 23 of 30 Muscovy and White Pekin ducks collected in central California having been found infected. It has been observed in both healthy and sick ducks and apparently has no ill effect.

A nematode parasite in Chinese ringneck pheasants (*Phasianus torquatus*) in the vicinity of Greeley, Colorado, H. W. MICKE (*Jour. Colo.-Wyo. Acad. Sci.*, 1 (1934), No. 6, p. 77).—In a survey of 76 Chinese ring-necked pheasants in the vicinity of Greeley, between October 8 and December 30, 1932, 61 pheasants were examined and 42.62 percent found parasitized by *Heterakis gallinae*. From March 11 to 24, 1933, 15 birds were examined and 86.67 percent found parasitized. The infestation was heavier among mature birds than among the young. Turkeys and chickens were also found to be parasitized by this nematode, although the extent of infestation among these fowls was not determined. No indications of ill effects due to these parasites were apparent in the birds examined.

Enzootic botulism amongst wild birds, E. MURRAY PULLAR (*Aust. Vet. Jour.*, 10 (1934), No. 4, pp. 128-135, figs. 3).—The author describes localized epidemics of botulism that have occurred in Victoria among wild water and shore birds. The disease appears to be associated with rotting vegetation and hot, dry weather rather than highly mineralized waters. The toxin-producing organism was identified as *Clostridium (Bacillus) parabotulinum* by the toxin-antitoxin test. Other theories as to the causation of the disease are discussed.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Puerto Rico Insular Station] (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed.*, pp. 75, 76, 119).—The progress results are briefly presented of experiments with land terracing for soil erosion control and with land drainage by underground tile, and on the vertical movement of irrigation water in fine sand soils to determine the absorptive capacity and velocity of percolation.

Surface water supply of Hawaii, July 1, 1931, to June 30, 1932 (*U. S. Geol. Survey, Water-Supply Paper 740* (1934), pp. V+121).—This report, prepared in cooperation with the Territory of Hawaii, presents the results of

measurements of the flow of streams and ditches in the Territory during the year ended June 30, 1932.

Brick lining used for irrigation canal in Texas, W. I. GILSON (*Engin. News-Rec.*, 113 (1934), No. 8, pp. 246, 247, figs. 3).—An account is given of the lining of an experimental 500-ft. section of irrigation canal.

The cost data indicate that the cost per square foot for this lining is less than for most types of concrete linings. No equipment is required for its installation other than simple devices which any intelligent foreman can make. Observations to date indicate that there is less cracking resulting from setting and temperature changes than in some forms of concrete lining. The semicircular section provides desirable hydraulic characteristics.

Public Roads, [September 1934] (U. S. Dept. Agr., Public Roads, 15 (1934), No. 7, pp. 165-184, figs. 12).—This number of this periodical contains the current status of U. S. Public Works road construction as of August 31, 1934, data on State motor-vehicle registrations and State motor-vehicle registration fees, 1933, and part 2 of an article on Power-Shovel Operation in Highway Grading, by T. W. Allen and A. P. Anderson (pp. 165-177) (E. S. R., 72, p. 113).

The physical properties of lumber, G. F. IVEY (Hickory, N. C.: Southern Pub. Co., 1934, pp. X+263, figs. 64).—This book contains practical information on the physical properties of lumber. It contains chapters on properties of woods in general; grading; weight; hardness; shrinkage (both radially and tangentially); strength, elasticity, and crushing strength; production; and a description of the principal species of trees.

Tests on nailed joints provide data on strengths, J. B. WELLS (*Engin. News-Rec.*, 113 (1934), No. 13, pp. 391, 392, figs. 3).—Tests conducted at Stanford University to measure deformation and ultimate strength in about 175 various nailed joints are reported. All lumber used was Douglas fir. All joints were made up with lumber of ordinary sizes and were nailed with common wire nails, except that in testing plywood galvanized, cement-coated, and barbed nails were used in addition to the common variety. Each joint was constructed of three pieces, a thick central block with a thinner piece nailed on each side. All nails were in single shear.

The data are presented graphically but no conclusions are drawn.

Data on structural use of plywood from two new test series, G. W. TRAYER (*Engin. News-Rec.*, 113 (1934), No. 6, pp. 172-176, figs. 5).—Two series of tests completed at the U. S. D. A. Forest Products Laboratory furnish new data on the use of plywood, particularly from a structural viewpoint. In the first tests the action of plywood when utilized as a structural covering for frame walls and wall units was studied, while the second investigation covered floor panels with stressed plywood coverings.

The results of both tests are significant. Briefly, for wall units, well-nailed plywood in large sheets was shown to contribute strength and rigidity comparable to that obtainable with diagonal lumber sheathing and much greater than that obtained with horizontal sheathing. By gluing the plywood instead of nailing it, strength and rigidity may be increased enormously.

In the floor-panel tests unusual advantages were demonstrated for units using plywood nailed and glued to the top of the joists as a subfloor and to the bottom of the joists as a ceiling. Such construction permits the plywood to contribute to the flexural strength of the floor system, and in effect reproduces the action of a box girder. Shallower joists are permissible, and greater stiffness and strength are obtainable with stressed plywood coverings.

Asphalt concrete for floor construction, C. H. JEFFERSON (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 1, pp. 3-9, figs. 7).—Practical information is given on the use of asphalt concrete for the construction of floors in farm buildings.

The principles of electric welding, R. C. STOCKTON (*London: Isaac Pitman & Sons*, 1933, pp. VII+184+23, figs. 73).—This handbook contains chapters on thermal and other methods of joining metals, properties of metals, metallic arc welding, examples of welding practice, testing welded work and welding materials, and electrical notes.

Photographic study of combustion in compression-ignition engine, A. M. ROTHROCK (*S. A. E. [Soc. Automotive Engin.] Jour.*, 34 (1934), No. 6, pp. 203-210, figs. 7).—This combustion study was made in a high-speed compression-ignition engine. A high-speed motion-picture camera and an optical indicator were used to take motion pictures of the flame travel and the pressure of development during combustion in the National Advisory Committee for Aeronautics combustion apparatus. Tests were made in which both the injection-advance angle and the engine-coolant temperature were varied. The results show that in a compression-ignition engine with a quiescent combustion chamber the flame first appears in the spray envelope and from there spreads to other parts of the chamber. The course of the combustion is controlled by the temperature and pressure of the air in the chamber from the time at which the fuel is injected until the time at which combustion starts.

The conclusion is presented that in a compression-ignition engine the ignition lag should be decreased to the largest value that can be used without excessive rate of pressure rise. Any further decrease in this lag decreases the combustion efficiency of the engine.

Spark arresters for motorized equipment, J. P. FAIRBANK and R. BAINER (*California Sta. Bul.* 577 (1934), pp. 42, figs. 22).—The results of a large number of field and laboratory studies are reported. Equipment devised for heating carbon to known temperatures and quickly ejecting it into vegetation to determine the sizes and temperatures necessary to start fires is described. A 2.5-kw. high-temperature, combustion tube furnace, rated at working temperatures up to 2500° F., was used for heating the carbon particles. Current was supplied by an engine-generator set mounted on a truck, and the temperature was controlled by voltage regulation. Five classifications of carbon sizes were used. The basis for segregation was a set of Tyler square-mesh screens in which the diameter of each succeeding opening was one-half that of the one preceding. The sizes of openings through which the carbon particles numbered 1 to 5 would pass were 0.371, 0.185, 0.093, 0.046, and 0.023 in.

It was found that the amount of carbon ejected with the exhaust gas for the average tractor engine varies from less than 0.1 g to 1.0 g per hour, according to the condition of the engine. On the average, 50 percent of this carbon is of a size that will not pass a 28-mesh, or size 5, screen. Since the kindling temperature for this carbon varied from 887° for size 5 to 1022° for size 2, evidently carbon can be ignited by the temperatures existing in the exhaust system of an internal-combustion engine.

Fires can be consistently started in dry vegetation by carbon particles, sizes 1, 2, and 3, with initial temperatures of 1500° to 1600°, during the normal summer conditions in California. In extremely warm dry weather fires may be started with these sizes at temperatures as low as 1300°.

Fires can be started by size 4 with an initial temperature of 1500° under conditions favorable to fire.

Carbon size 5, when heated to an initial temperature of 1500°, can start a fire in dry grass on extremely hot, dry days. This size of particle, however, lost its heat so rapidly that it ceased to glow within a distance of 9 ft. from the furnace when heated to an initial temperature of 1800°. In practice, therefore, the exhaust pipe could be turned up, discharging into the air, thus providing the necessary distance for cooling the smaller particles before they reach the ground.

The tendency for brush-field and pine-needle litter to be ignited by carbon sparks is about the same. Both catch fire less easily than dry grass. Punk, however, was found not only to be readily ignited but to cause hang fires; that is, the material did not blaze immediately but continued to smoulder and finally burst into flame. In one case the time was 40 min.

Exhaust pipes having surface temperatures of 1200° may start fires upon contact with dry grass. Surfaces with temperatures as low as 838° may ignite dry vegetation after several minutes of contact, which could occur if dry grass or straw lodged on an exhaust manifold. If the surface shows even the slightest red color when viewed at night it is dangerous, and the part should be so placed or guarded that it will not touch vegetation.

Several commercial spark arresters now on the market were above 95 percent in efficiency in stopping carbon sizes 2 and 3, but all were 80 percent or below in efficiency for size 4. One commercial arrester was below 20 percent in efficiency for all sizes of carbon. The efficiency of one arrester was increased from 69.3 to 97.6 percent for size 4 carbon by a slight modification in design. One experimental arrester had an efficiency of 93 percent or higher for carbon sizes 2, 3, and 4. The arresters with the highest efficiency created the least back pressure on the exhaust system. The average muffler cannot be considered a satisfactory spark arrester, though no doubt it assists somewhat, especially in the cooling of particles.

Iron screen over the exhaust pipe presents considerable danger, as holes may burn through without the operator's knowledge, thus presenting a fire hazard from an unprotected exhaust system until replaced. Alloy screens consisting of 80 percent nickel and 20 percent chromium stood up much better than iron screen. The cheaper grades of these alloy screens, however, contain varying amounts of iron and are therefore unsuitable for this type of apparatus.

Lubricating oil tests, J. I. CLOWER (*Va. Polytech. Inst. Bul.*, 27 (1934), No. 11, pt. 2, pp. 41, figs. 15).—This is a practical interpretation of the significance of the chemical, physical, and mechanical tests commonly applied to lubricating oils.

Centrifugal pumps, turbines, and propellers, W. SPANNHAKE (*Cambridge: Mass. Inst. Tech.*, 1934, pp. XIV+328, figs. 182).—This translation from the German, by J. B. Drisko, is a comprehensive treatment of the fluid mechanics of rotary hydraulic machinery. It is divided into sections relating to the essentials of hydromechanics, the full-admission turbo-runner in enclosed flow, full-admission turbo-runners in unenclosed flow, and the modern impulse turbine, and contains chapters on the properties of ideal, constant-volume fluids—fundamental concepts and definitions; the characteristic types of motion of flowing fluids, with descriptions; dynamics of ideal fluids; viscous liquids; forces acting and exchange of energy between flowing fluids and still or moving rigid bodies; description of the full-admission runner in enclosed flow and its field of flow; forces acting and exchange of energy in the full-admission turbo-runner in enclosed flow; similitude relations and type series of turbo-machines; supplement to the basic theory of full-admission turbo-runners in enclosed flow; jet

theory of axial runners in unenclosed flow; and unidimensional theory of the Pelton turbine.

A new type winnowing machine for the separation of grain and bhoosa, T. A. M. BROWNLIE (*Agr. and Livestock in India*, 4 (1934), No. 1, pp. 29-35, pls. 2).—This machine is described and illustrated, and the tests forming the basis of its development are reported. The tests definitely showed that owing to the lightness and flaky nature of bhoosa the simplest method of separation from the grain was by allowing the mixture a perfectly free fall in a continuous stream of definite width and trifling thickness and by passing a current of air through this falling curtain of the material.

Tests with air currents from 9 to 20 miles per hour indicated that the grain-bhoosa mixture could not be satisfactorily separated when falling through an air current of less than 4.5 ft. diameter, and the most satisfactory and economical results were obtained with an air current of 5 ft. diameter and a wind velocity between 11 and 16 miles per hour. To meet these requirements a blower of the impeller type was adopted, this constituting a new development in winnower design.

The resulting machine comprises a steel frame on which is mounted a 6-blade fan of the impeller type, 5 ft. in diameter, discharging 25,000 cu. ft. of air per minute at a velocity of 14 miles per hour and having an efficiency of over 90 percent. Surrounding the fan and carried on three rollers of the drum type is a conveyor of the flexible ladder and scraper bucket type. The buckets, or scrapers, carry the grain-bhoosa mixture up a nearly vertical guide plane and thence over a horizontal distribution platform above the fan. The horizontal distribution platform is cut away at an angle to its length, thus permitting the contents of each bucket to discharge gradually over the entire length of the cut on to a chute in front of the fan. Thus a continuous stream of the grain-bhoosa mixture in the form of a curtain of width less than the diameter of the fan and a thickness just over 1 in. falls into the air current and at right angles to that current.

Problems in heating the wash water in apple washing machines, A. H. REED (*Ill. State Hort. Soc. Trans.*, 67 (1933), pp. 276-292, figs. 2).—In a contribution from the Illinois Experiment Station the methods of operating the various systems of heating wash water are described and their advantages and disadvantages discussed.

Condensation of moisture in flues, W. R. MORGAN (*Ill. Engin. Expt. Sta. Circ.* 22 (1934), pp. 22, figs. 9).—The moisture content of flue gases resulting from the combustion of anthracite, semibituminous, and bituminous coals, oil, natural gas, and manufactured gas were calculated for a total of 23 individual fuels. The condensation to be expected with anthracite and soft coal and with manufactured gas was computed, using the calculated average moisture content of the flue gases for each type of fuel and the experimentally determined flue-gas temperatures for a wide range of firing rates. From these data the saturation temperatures of the flue gases and the amount of condensation at normal chimney temperatures for such fuels have been determined.

It is evident that for any given firing rate and flue-gas temperature, condensation is highest for the fuel having the highest dew point and lowest for the fuel having the lowest dew point.

In studies of an actual installation it was found that no condensation occurs with anthracite because the temperature of the flue gases is never below the dew point. A small amount of condensation may occur with soft or bituminous coal at low firing rates. Extremely heavy condensation occurs with manufactured

gas but under distinctly different conditions than with coal. With gas a maximum condensation of about 6.75 lb. per hour occurs with a firing rate of 84,000 B. t. u. per hour, corresponding to an outdoor temperature of approximately 15° F. The maximum condensation for soft coal occurs in mild weather, while for the gas the maximum condensation, approximately 18 times the maximum for soft coal, occurs when the outdoor temperature is about 15° above zero.

Because of the less severe temperature conditions in the flue when gas is used as fuel, vitrified impermeable liners, provided possibly with sockets, could be used without much danger of breakage or disintegration. Such liners would eliminate seepage, and for this reason it would be necessary to make provision for drainage of the condensate from the chimney.

An appendix describes the methods of calculation used in the study.

AGRICULTURAL ECONOMICS

[**Farm economics studies in Great Britain**] (*Farm Econ.* [Oxford Univ.], 1 (1934), Nos. 6, pp. 105-128; 7, pp. 129-151).—Included are articles as follows: Variations in the Cost of Wheat Growing, by R. McG. Carslaw and A. L. Jolly (pp. 105-109); Piece Work on the Sugar Beet Crop, by R. N. Dixey (pp. 109, 110); Cultivation Costs on a Mechanised Crop Farm, by J. R. Lee (pp. 111, 112); The Profitability of Cattle and Sheep Farming in 1932-33, by W. H. Long and C. Daniel (pp. 113, 114); Recent Modifications in Poultry Management, by A. G. Ruston (pp. 115, 116); Replacement Costs on the Commercial Egg Farm, by F. S. Dennis (pp. 117, 118); Indicators of Success in Milk Production, by C. V. Dawe and D. F. Ruston (pp. 118, 119); Farm Transport by Motor Lorry, by A. Bridges (pp. 120-122); Changes in Rents of Mid-Devon Farms, by J. J. MacGregor (pp. 129, 130); Cost of Rearing Sex-Linked Pullet Chicks on a Midland Farm in 1933, by J. R. Lee (pp. 131, 132); Capital Requirements of Poultry Farms in the Bristol Province, by C. V. Dawe and J. D. Nutt (pp. 132, 133); Cropping Records for Farm Management Control, by A. Bridges (pp. 134, 135); The Financing of the Marketing Boards, by K. A. H. Murray (pp. 136-138); Cost of Production as a Basis for Hop Prices, by R. L. Cohen (pp. 139-141); The Influence of Price Fluctuations on Consumer Demand, by A. W. Menzies-Kitchin (pp. 141-143); and The Extent and Means of Assistance to the Sugar Beet Industry, by A. Bridges and K. A. H. Murray (pp. 144-147).

Each number includes charts showing the prices of agricultural commodities in England and Wales, 1931-34, and lists of recent articles on farm management in England, Scotland, and Wales.

[**Farm economics research in England, 1932**], C. S. ORWIN (*Jour. Roy. Agr. Soc. England*, 94 (1933), pp. 247-267).—The research work in 1932 is briefly described and some findings are given under the headings of policy and organization, farm management, markets and marketing, prices, and miscellaneous studies. A list of publications during the year is included for each division.

[**Papers presented at 1933 meetings of the [British] Agricultural Economics Society**] (*Jour. Proc. Agr. Econ. Soc.*, 3 (1934), Nos. 1, pp. 13-63; 2, pp. 70-112).—Included are the following papers and discussions thereon presented at the meetings held at Cambridge, June 30 and July 1, and London, December 5 and 6, 1933: Presidential Address—The State and Agriculture, by J. A. Venn (pp. 13-24); The Distribution of the Agricultural Income, by D. A. E. Harkness (pp. 25-39); The Value of Physical Data in Farm Management Problems, by W. H. Long (pp. 40-50); The Connection Between Tenant-Right Valuation and

Farming Efficiency, by E. P. Weller (pp. 51-63); The Agricultural Marketing Act, 1933, by R. C. Hinton (pp. 70-81); Market Intelligence—Collection and Uses, by G. S. Dunnett (pp. 82-93); The Relation of the Agricultural Economist to Practical Farm Management, by J. R. Currie (pp. 94-104); and Organized Marketing in Relation to Progress in Production, by J. L. Davies (pp. 105-112).

Cost per unit as a measure of efficiency, M. A. KNOX (*Jour. Southeast. Agr. Col., Wye, Kent, No. 32 (1933), pp. 38-41*).—Brief analysis is made of cost per unit as a measure of economic efficiency in agriculture. The author finds that notwithstanding its familiarity and importance in many directions, "(1) as a measure of the efficiency with which one particular factor is handled it suffers in that it can be directly influenced by matters which have no direct bearing on that particular factor", and "(2) as a measure of the combined influences of all factors it suffers in that it cannot reflect all matters which the farmer must take into consideration."

Rate of turnover as a factor influencing farm profits, M. A. KNOX (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 19-23*).—Brief analysis is made of rate of turn-over of capital as a factor influencing farm profits.

The agricultural situation in 1932-33 (*Roma: Internatl. Inst. Agr., 1934, pp. VIII+580*).—This economic commentary on the International Yearbook of Agricultural Statistics for 1932-33, previously noted (E. S. R., 71, p. 552), is the fourth in the series of commentaries on such yearbooks (E. S. R., 70, p. 113). The several chapters (1) discuss the economic tendencies in world agriculture in sections on planned economy and its problems, the evolution of modern commercial policy, and economic planning in agriculture; (2) summarize the position and tendencies during the year of the international markets for cereals, sugar, coffee, tea, cacao, wine, olive oil, textile materials, livestock, and livestock products; (3) set forth the results, so far as they concern agriculture, of important international conferences held during the year; (4) describe, by countries, the government measures for farm relief and the actions taken by voluntary organizations in the interest of producers; and (5) discuss the agricultural conditions of agriculture in different countries.

Corn and hogs under the Agricultural Adjustment Act, D. A. FITZ GERALD (*Washington, D. C.: Brookings Inst., 1934, pp. X+107, fig. 1*).—This pamphlet is the first of an informational series on various phases of the operation of the Agricultural Adjustment Act. The Agricultural Adjustment Administration, trade associations, cooperative organizations of farmers, and educational institutions were drawn upon for information through a system of more than 25 "resident observers" located in the principal market centers or attached to the various agricultural colleges.

The information is presented in sections on the corn-hog situation, steps in the development of the corn-hog program, the emergency hog marketing campaign, Federal distribution of meat for relief purposes, corn loans, corn-hog production control, and financing the corn-hog program. Appendixes include the Agricultural Adjustment Act, the proposed marketing agreement for the meat-packing industry, and short discussions of the effect of the emergency campaign on hog prices and of the gross income to hog producers from the emergency campaign.

Dairy products under the Agricultural Adjustment Act, F. F. LININGER (*Washington, D. C.: Brookings Inst., 1934, pp. VIII+99, figs. 2*).—This is the second of the series noted above. The material is presented in sections on the dairy situation, 1933, the marketing system for dairy products, the Administration faces the dairy problem, fluid milk agreements in 1933, licenses and

enforcement, national agreements, stabilization operations in the butter market, production control, and recent changes in policy. Appendixes include the Agricultural Adjustment Act, statistical tables, a summary of the Agricultural Adjustment Administration dairy plan, and agreements and correspondence pertaining to the Chicago milk strike.

Wheat under the Agricultural Adjustment Act, S. JOHNSON (*Washington, D. C.: Brookings Inst., 1934, pp. VIII+103, fig. 1*).—This is the third of the series noted above. Following a brief summarization of the Agricultural Adjustment Administration wheat program, the material is presented in sections on the wheat adjustment program as evolved, expected effects on growers' prices and incomes, administrative policy and organization, the educational campaign, the application sign-up and local organization work, problems met and dealt with, and some early results of the program. The Agricultural Adjustment Act is included in an appendix.

An analysis of agriculture on the Milk River irrigation project, P. L. SLAGSVOLD and G. H. BINGHAM (*Montana Sta. Bul. 290 (1934), pp. 80, figs. 20*).—The development of the project, the climate, topography, soil, water supply and irrigation, drainage, maintenance and operation, construction charges, financial condition of the irrigation districts, taxes, transportation, markets, etc., are described. The development of agriculture on the project is summarized, and an analysis is made of the crop and livestock combinations in 1926, 1930, and 1933. Some recommendations are made as to farming practices for the project, and the use of the budgeting method of planning a farm business is illustrated.

A study of land utilization in Grafton County, K. E. BARRACLOUGH and C. E. WALKER (*Jour. Forestry, 32 (1934), No. 7, pp. 695-700*).—In this preliminary report on a study conducted by the New Hampshire Experiment Station in a rough and rocky region lying in and about the town of Dorchester, the authors discuss the agricultural history of the locality and suggest a plan of public ownership of the forest lands with a view to providing work for the rapidly declining population. In 1840, when agriculture reached its peak, there were 840 people in Dorchester as compared with 115 at present. In 1840, 39 percent of the township consisted of cleared land as compared with only 3 percent at present.

An economic study of farms in the spring wheat area of South Dakota, C. M. HAMPSON and P. CHRISTOPHERSEN (*South Dakota Sta. Circ. 19 (1934), pp. 19, figs. 3*).—This is the first of a series of three circulars on the economics of agriculture in the spring wheat area of South Dakota. It is based upon 283 records obtained during the years 1930 to 1933, inclusive, from farmer co-operators in 7 counties in a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. It describes the climate and soils of the area and changes in farming since 1890, and discusses the size, types, organization, and ownership of the farms, production of crops and livestock, and the returns to different types of farms, to different ownership classes, and for the different years.

Estimated returns from farms of large, medium, and small size of business in the spring wheat area of South Dakota, C. M. HAMPSON and P. CHRISTOPHERSEN (*South Dakota Sta. Circ. 20 (1934), pp. 23, fig. 1*).—This is the second of the series of circulars noted above. It "discusses the comparative returns that may be expected from farms of large, medium, and small size of business, under different situations of prices, production, and land valuations." In each size group a diversified farm farmed rather intensively and one farmed rather extensively are used for illustrations.

Estimated returns from operating 800 acres in the spring wheat area under four different plans, C. M. HAMPSON and P. CHRISTOPHERSEN (*South Dakota Sta. Circ. 21 (1934), pp. 20, figs. 2*).—This is the third circular of the series noted above. It discusses and compares the returns that may be expected from an 800-acre diversified farm operated under 4 different plans of organization common to the area, and under different price and production situations.

Lamb feeding costs and returns in Michigan, P. F. AYLESWORTH (*Michigan Sta. Quart. Bul., 17 (1934), No. 1, pp. 9-15*).—Records of lamb feeding costs during the 1933-34 feeding season obtained from 50 feeders are analyzed. A table shows for the 50 feeders and for the 10 high- and 10 low-profit feeders the average charges, credits, amounts of feed fed, etc., per farm, per lamb, and per pound of gain. Comparisons are made with findings in the three previous years. The factors affecting costs and returns are discussed.

The returns per dollar's worth of feed fed averaged \$2.21 for the 50 feeders, \$2.49 for the 10 high-profit feeders, and \$1.18 for the 10 low-profit feeders. The average profits per lamb were \$1.79, \$2.74, and 32 ct., respectively, and per pound of gain 7.7, 9.1, and 2.2 ct., respectively.

1933 dairy costs and returns in Michigan, K. T. WRIGHT (*Michigan Sta. Quart. Bul., 17 (1934), No. 1, pp. 34-38*).—Analysis is made of records obtained from 74 herds included in dairy herd improvement associations. Tables show the average charges, credits, profits, amounts of feed fed, etc., by herd, 100 lb. of milk, and per pound of butterfat produced. The factors affecting costs and returns are discussed. Scored on the basis of whether costs per pound of butterfat for feed, labor, buildings, equipment, and depreciation in cows and whether the average butterfat production per cow were above the average, the group of herds with the lowest score averaged 278 lb. of butterfat per cow, a butterfat cost of 39.2 ct. per pound, and a loss of \$11.21 per cow. The high scoring group averaged 389 lb. of butterfat per cow, a butterfat cost of 24.4 ct. per pound, and a profit of \$20 per cow.

Development of the sugar industry in Mysore, L. C. COLEMAN (*Mysore Dept. Agr., Gen. Ser. Bul. 18 (1934), pp. [5]+25, pls. 11*).—A short record is given of the work of the Mysore Agricultural Department and the Mysore Sugar Company toward the establishment of a sugar industry in the Mysore State. Intensive work in the new area beginning in 1931 is described.

Economic handbook of the Pacific area, edited by F. V. FIELD (*Garden City, N. Y.: Doubleday, Doran & Co., 1934, pp. XL+649, [pl.] 1, [figs.] 4*).—"This volume attempts a survey of the economic factors underlying present international forces in the Pacific area, and takes as a starting point the relation between the population of each country and its physical environment." The several chapters deal with population, land utilization, food production and consumption, transportation, public finance, capital movements, trade, international mineral products, and international agricultural and textile products.

Assessment of farm property in Ontario, S. C. HUDSON (*Sci. Agr., 14 (1934), No. 11, pp. 624-629, figs. 2*).—Analysis is made of the ratios of tax assessments to actual farm values as estimated by the farm operators, and of the relations of value and size of farm, per acre value, and proportion of total value of buildings to the same ratios in nine townships in the Province of Ontario, Canada. The assessed values ranged from about 15 to over 115 percent of the estimated actual valuations, averaging 53.9 percent. Of the farms 22 were assessed from 15 to 39.9 percent, 199 from 40 to 74.9 percent, and 25 from 75 to 119.9 percent of their actual valuations. The study shows that (1) lower-valued farms were assessed at a higher ratio than higher-valued farms and the assessments were less accurate, (2) farms of a low per acre value were

assessed at a higher ratio than those with a high per acre value, and (3) farms with a relatively small proportion of the total value in buildings were assessed at a distinctly smaller ratio than those with a large proportion of the value in buildings.

Farm real estate tax delinquency in South Carolina.—A preliminary report, G. H. AULL and E. RILEY (*South Carolina Sta. Bul.* 298 (1934), pp. 30, figs. 6).—This is a preliminary report of the results of a study made in 1934 in cooperation with the Federal Civil Works Administration and the State Emergency Relief Administration. It is largely a tabular presentation, tables being included showing, by counties, by years 1928–32, the number of farm properties and total acreage returned for taxation, the number and percentage of farm properties and of acreage on which taxes were allowed to become delinquent, total taxes levied on farm real estate and the percentage such taxes were of all taxes levied on real estate, amount and percentage of farm real-estate taxes delinquent, and the percentage of total delinquent farm real-estate taxes paid in years subsequent to the delinquency date. The accumulated amounts of farm real-estate taxes becoming delinquent and the amounts paid on such delinquencies during the period 1928–32 are also shown by counties.

The tariff: A bibliography (Washington: U. S. Tariff Comn., 1934, pp. IX+980).—This is a select list of references grouped under the following headings: General collections of treaties, tariff acts, regulations, and decisions (texts and digests); dictionaries and encyclopedias; theory; history, policy, and practice; administration; legislation; economic aspect; tariff controversy; local protectionism; bibliography; and debate material. The parts on history, policy, and practice and economic aspect include sections on agriculture. Appendixes include a list of periodicals devoting “more than passing attention to tariff matters”, a list of libraries “that lay more than ordinary stress on the tariff”, and a list of congressional and departmental documents, reports, etc. Author and subject and title indexes are included.

International yearbook of agricultural legislation, 1932 [trans. title] (*Inst. Internatl. Agr.* [Roma], *Ann. Internatl. Lég. Agr.*, 22 (1932), pp. LXXXVIII+1574).—This volume continues the series previously noted (E. S. R., 69, p. 448). The most important legislative measures and decrees and references to those of secondary importance showing the title, date of promulgation, and official publication in which they appear are included. The introduction briefly describes the contents of laws and orders and the general tendencies of the agricultural legislation during the year.

Horticultural accounts, J. WYLLIE (*Jour. Southeast. Agr. Col.*, Wye, Kent, No. 32 (1933), pp. 24–27).—Horticultural account-keeping is discussed under the headings of objectives, valuations, methods of accounting, and interpretation and use of results.

Interrelationships of daily prices and supply in the New York egg market, K. VOET ([*New York*] *Cornell Sta. Bul.* 596 (1934), pp. 50, figs. 48).—This study covers the years 1923–29 and is “an attempt to analyze the relationships which exist between daily prices, daily receipts, and other factors in the New York wholesale market for eggs.” The general price situation and the yearly receipts of eggs in New York City, 1900–1932, and the sources of shipments of eggs to New York City, 1923–29, are discussed. Analysis is made (1) by days of the week, usually for the entire year, and by the periods December–March, April–July, and August–November of the average receipts in New York City, cold-storage holdings and movements, market-storage holdings and movements, trade output, prices, etc.; (2) the effects of daily receipts on prices and on daily cold-storage and market-storage movements; and (3) the

effects of daily prices and previous price development on receipts. Some of the findings were:

The average daily receipts for the period varied from 34,780 cases on Mondays to 13,010 cases on Saturdays, the weekly average daily receipts being 23,120 cases. The average daily cold-storage holdings did not vary more than 1 percent during the week. Market-storage holdings were only 7 percent as large as holdings in cold-storage houses. Daily market-storage holdings fluctuated more during the week than cold-storage holdings, being relatively low on Monday morning and increasing until Thursday. The day-to-day market-storage fluctuations were greatest from April to July, and the movements relative to receipts were largest from August to November and smallest from December to March. Trade output varied less than receipts throughout the week. Prices did not fluctuate much during the course of the week, but were slightly lower than the average on Tuesdays and Thursdays and slightly higher on the other days.

Day-to-day fluctuations in prices were largest from August to November and from Monday to Tuesday and smallest from Friday to Saturday. The elasticity of daily prices to daily receipts was greatest from December to March when prices fell. From April to July, when many eggs were moving into storage, there was practically no relationship. Eggs were moved more readily into market storage than into cold storage, but were removed more readily from cold storage. Receipts affected cold-storage movements for several days. The effect was greatest from April to July. Receipts did not affect market-storage movements longer than one day. Relatively low prices caused decreases and relatively high prices increases in later receipts. While prices on the first three days of the week affected receipts on later days, the receipts on the first three days were least effected by previous prices. Prices showed the highest and quickest effect on later receipts from August to November and had practically no effect from April to July. High prices affected later receipts more after a previous price decline than after a previous price advance. The effect was greatest after prices had moved in the same direction for two days. Longer previous movements did not stimulate the effect on later receipts. Wednesday's prices affected receipts on the following Monday and Tuesday only when the price previous had changed in the same direction for more than one day. The greatest effect was when the price movement started in the preceding calendar week.

Crops and Markets [August–September 1934] (*U. S. Dept. Agr., Crops and Markets*, 11 (1934), Nos. 8, pp. 273–336, figs. 3; 9, pp. 337–376, figs. 3).—Included in both numbers are tables, reports, summaries, charts, etc., of the usual forms covering crop and livestock estimates, market reports, and the price situation. An article in No. 8 entitled *Income from Farm Production in the United States, 1933* (pp. 314–335), includes and discusses tables showing (1) for production as a whole in the United States for 1933, with comparisons for previous years, the gross income from farm production, total and by groups of commodities, estimated operating expenditures for different purposes, cash income, production expenses, and cash available after deducting such expenses, income available for operators' capital, labor, and management, changes in the value of farm operators' capital of different kinds used in agricultural production, and the distribution of income available for operators' labor, capital, and management; and (2) for 1931, 1932, and 1933 (preliminary) the estimated farm value of and gross and cash income from farm production, by States and commodities.

Index numbers of production, prices, and income, J. I. FALCONER (*Ohio Sta. Bimo. Bul.* 170 (1934), p. 190).—The table previously noted (E. S. R., 71, p. 866) is brought down through July 1934.

RURAL SOCIOLOGY

Elements of rural sociology, N. L. SIMS (*New York: Thomas Y. Crowell Co.*, 1934, rev. ed., pp. XV+718, [pls. 5], figs. [72]).—A revised and enlarged edition (E. S. R., 60, p. 591).

The technique of social investigation, C. L. FRY (*New York and London: Harper & Bros.*, 1934, pp. XII+315, [pls.] 4, [figs.] 2).—This volume attempts to describe and illustrate concretely certain elementary but basic issues connected with the task of making a dependable social study. It is intended primarily for the use of investigators who have had little or no experience with the actual problems of social inquiry.

California county expenditures, J. K. GALBRAITH (*California Sta. Bul.* 582 (1934), pp. 108, figs. 22).—This study is based chiefly on compilations made by the State Controller's Office and published annually under the title of Financial Transactions of Municipalities and Counties of California. In the analysis district expenditures for education and highways are included with county expenditures, but expenditures on account of reclamation, irrigation, and levee districts are excluded. Expenditures for the redemption of debt, both on county and district bonds, are also excluded in the historical analysis. No extended consideration is given to sources of funds.

The study is made in three stages: A historical analysis of county expenditures, 1914-15 to 1931-32, an analysis of the situation in county expenditures, 1929-30 to 1931-32, and an appraisal of the financial possibilities of various suggested reforms in county expenditures. The historical analysis includes tables showing, by years, the expenditures, total and per capita, in all (57) counties of the State, exclusive of San Francisco County, and in the 54 counties, exclusive of San Francisco County and the metropolitan group (San Diego, Alameda, and Los Angeles Counties), and the total expenditures and indexes of such expenditures in the 54 counties for education, highways, charities and corrections, general government, protection to persons and property, health and sanitation, recreation, interest, and miscellaneous expenses. Charts are also included and discussed comparing the indexes of the expenditures for different purposes with those for total expenditures.

In the analysis of average expenditures from 1929-30 to 1931-32, the counties are divided into seven groups on the basis of population in 1930, the seventh group being the three metropolitan counties. Tables show for each county the amount and the per capita levels of all expenditures, the expenditures for the various purposes studied in the historical analysis, and for debt redemption and subgroups under the different purposes. Charts show the comparative per capita expenditure and the proportion of all expenditures for different purposes by the county groups. The section on expenditure reform discusses the possibilities of retrenchment in expenditures, county reorganization, and the consolidation of counties, especially those with smaller populations.

The per capita total expenditures in the 54 counties were \$27.30 in 1914-15, were from \$27.80 to \$29.14 in the next four years, increased from \$35.71 in 1919-20 to \$51.77 in 1922-23, decreased to \$47.16 in 1925-26, were between \$48.82 and \$51.79 during the next four years, increased to \$54.99 in 1930-31,

and decreased to \$52.02 in 1931-32. The index numbers in 1931-32 (1914-15=100) were for education 405.9, highways 163.4, charities and corrections 503.6, general government 190.7, protection to persons and property 315.3, health and sanitation 1,186.9, recreation 1,293.8, miscellaneous 87.0, and interest 459.4. For the period 1929-30 to 1931-32, the average per capita total expenditures for the different county groups were (1) 5,000 or less population \$77.85, (2) 5,000-10,000 population \$59.95, (3) 10,000-20,000 population \$64.27, (4) 20,000-40,000 population \$55.70, (5) 40,000-80,000 population \$55.21, (6) 80,000 and over, except counties in the metropolitan group, \$53.78, and the metropolitan group \$51.78. The percentages of total expenditures (\$55.46 per capita) in the 54 counties for different purposes were for education 50.3, highways 14.8, charities and corrections 8.5, general government 7.6, protection to persons and property 4.6, health and sanitation 1.6, recreation 0.6, miscellaneous 1.2, interest payments 5.0, and redemption of debt 5.7.

The growth of the farm family in relation to its activities, C. P. LOOMIS (*North Carolina Sta. Bul. 298 (1934), pp. 61, figs. 39*).—This study seeks to measure the influence of growth of farm families upon their internal and external social development and upon some of their economic activities. It observes the changes in the size of the family or household group with the passing of time and the influence of these changes upon some of the more general traits of agricultural, social, and economic life.

The study includes 345 white owners and 264 white tenant families in Wake County. Since in part of the analysis the families with dead parents are excluded, the number most often used is 311 owner and 256 tenant families. Including 2,945 persons, these 567 families represent about 14 percent of the total white farm families in the county and 15 percent of the total white farming population.

The life cycle of the family or household may be said to have its positive basis in part in (1) additions due to births of children and (2) additions due to relatives who are not children. The negative basis lies in the gradual breaking-up of the family unit as the children leave the parental home. The growth of the family unit resulting from additions of persons who are not the children of the parents indicate that the rural family is a protective society for the aged and also for helpless children. Instead of establishing old age and other insurance systems, the rural family itself may be considered as an insurance institution.

The process of breaking up of the family unit follows a different pattern for owners as compared with tenants. Tenant children leave home earlier and directly for marriage to a greater extent than owner children. On the whole about the same proportion of owner and tenant children continue the industry of farming. These data refute the contention that rural society selects its least competent persons to remain on the farm and sends its best elements to the city.

The more working units there are in the farm family the more land it will be likely to farm. The increase in the acreage as the family grows and its decrease as the family becomes smaller must be significant because without a doubt the other forces are working also. On the whole the income accruing to the family from the farm enterprise follows the same pattern as does the number of crop areas farmed by the family in the different stages of the life cycle. The income per adult unit does not fluctuate greatly. The large family tends to earn a larger income than does the small family. The owner family

puts more money into the farm enterprise and into investments in land, whether computed on the basis of average per household or proportion of the total budget, during the time the family has the largest working force. This is not true in the case of the tenant family. The large family tends to spend a larger proportion of the total budget for food than does the small family. In the case of tenants, this is also true for clothing. In general, the family with many small children and the family made up of the old parents are, relatively speaking, most burdened with sickness. As the family grows it does not increase the size of the home as it does the farm land acreage.

Negro life in rural Virginia, 1865-1934, W. E. GARNETT and J. M. ELLISON (*Virginia Sta. Bul.* 295 (1934), pp. 59, figs. 14).—Negroes constitute a little over one-fourth of the rural population of Virginia, and the conditions of life of such a large group of people affect the welfare of the State in many ways. This bulletin, based mainly on field data, is also one of a related series of rural organization and rural community life studies (E. S. R., 64, p. 91; 70, p. 122). The two chief points of emphasis are (1) conditions and trends in Negro community life, and (2) the progress Virginia Negroes are making along various lines, especially in those fields having the most bearing on community life. It is written primarily from the rural viewpoint, though urban data are included at various points for comparisons or where the two cannot be segregated.

The percentage of Negroes in the State's rural population is steadily declining in sections where Negroes are in a minority. In most of the 21 counties where this race is in a majority, Negroes have shown an increase in numbers since 1870. The decline in Negro population is making it difficult in some sections to keep up the schools and other Negro community institutions.

Negroes have made good progress in improving their standards of living, but their incomes are generally too low to maintain good living standards. Few have such conveniences as running water, electric lights, telephones, or radios. Greater progress has been made in the improvement of their educational level than in almost any other aspect of Negro life. Negro school facilities are improving, but taken as a whole they are still very inferior to those of the whites.

Health conditions are improving, but for several diseases the death rate for Negroes is still nearly double that of the whites. Progress in improving health conditions is greatly handicapped by ignorance, low incomes, and low standards of living.

Several cases of highly developed, well-rounded community life were found in the eastern part of the State. In each of these instances the development appeared to be due to a good economic base and strong resident leadership. Community life in the Piedmont and Southside Counties is often poorly developed. Community groups in these counties are frequently weak and in many cases growing weaker through migration.

Data from penitentiary records show that the Negroes have a higher crime rate than the whites. Negroes do not generally vote, although a growing urge is expressed for more participation in citizenship privileges. On the whole, relations with the whites are deemed good, but under the surface the author mentions "much bitterness over various discriminations and discourtesies to which Negroes are frequently subjected." There is a growing interest among the whites in interracial problems and a growing disposition to correct causes of friction. The Interracial Commission is doing much good work to improve racial relations.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Directory of agricultural and home economics leaders (*Cambridge, Mass.: William Grant Wilson, 1934, 16. ed., pp. 790*).—This directory includes the technical personnel of the U. S. Department of Agriculture, the State agricultural colleges and experiment stations, State departments of agriculture, and agricultural organizations, and other data for the United States and Canada.

International agricultural directory, edited by J. W. PINCUS (*Cambridge, Mass.: William Grant Wilson, 1934, [3. ed.], pp. [4]+805-896*).—This supplements the directory noted above by similar data for institutions in other countries. A list of national and international organizations doing colonial or other agricultural work is included for the first time. International agricultural conferences and agricultural congresses and conferences in the United States are also listed.

A study of rural education in Illinois with special reference to vocational agricultural education for the fifteen-year period, 1917 to 1932, C. COLVIN (*Abs. Thesis, Univ. Ill., Urbana, 1934, pp. 15*).—This is an abstract of a thesis submitted to the University of Illinois in partial fulfillment of the requirements for the degree of doctor of philosophy in education. "This study is concerned with the elements of rural life that demand special attention in a program of rural education. For purposes of this study, rural education is intended to signify, not the total education of rural people, but rather that part of such education which deals with activities that are unique in rural life and that belong to a program designed to prepare for living on the farm. The specific problem may be stated as follows: (1) To list and briefly examine the important organized agencies that contribute to rural education. (2) To identify the activities which should be of major importance in rural life. (3) To examine in detail the program of and contributions to rural education, of vocational agricultural education in Illinois, for the 15-year period closing June 30, 1932."

A study of teachers of vocational agriculture in the Philippines, F. M. SAGAY (*Philippine Agr., 23 (1934), No. 2, pp. 98-110*).—"The purpose of this study was to find out the technical and professional training and experience of teachers of agriculture in the Philippines. Other factors which influence the efficiency of teaching, such as age, occupational background of the teacher, and variety of subject taught, were also included in the study. On the basis of the findings, certain implications were drawn concerning the program of training teachers of agriculture."

Farm poultry production, L. E. CARD and M. HENDERSON (*[Urbana, Ill.: Authors], 1933, pp. 202+[6], figs. 60*).—This text was prepared with a view to having it particularly adapted to the needs of students of vocational agriculture in sections where poultry is an important part of the farm business but where specialized poultry farming is rather uncommon. The several chapters cover the business of poultry keeping, judging fowls for egg production, feeding hens, housing farm poultry, maintaining a healthy flock, hatching and raising chicks, increasing returns by better marketing, and improving the flock by breeding.

FOODS—HUMAN NUTRITION

The influence of chemical and physical factors on egg-white foams, M. A. BARMORE (*Colorado Sta. Tech. Bul. 9 (1934), pp. 58, figs. 34*).—The appara-

tus used in this study included an electric food mixer capable of operating the double whip free of any material at 400, 660, and 1,000 r. p. m. at first, second, and third speed settings, and at 925 r. p. m. at the third setting in the egg whites; a photomicrographic equipment; a chainomatic balance with a platinum-iridium ring for surface tension measurements; Ostwald viscosity pipettes; and a quinhydrone apparatus for pH measurements. The eggs were obtained either on the day laid or the following morning from a local poultry flock of White Leghorns and were stored at room temperature until used. The whites of from 12 to 15 eggs were stirred in the quart bowl of the electric mixer for from 5 to 25 min. at low speed to insure uniform mixing, and for each of the tests made 53 cc of the mixture was measured out and placed in a similar bowl and the mixer started at the third speed.

In the study of the effect of physical factors on foam characteristics, the first variable selected was that of beating time. The egg whites (3 days old) were stirred for 15 min. and then beaten as described at room temperature for periods varying from 1 to 5 min. Specific-gravity measurements were then made and a small portion of the foam placed on a microscope slide, covered with a cover glass, and photographed 2 min. after the beating had been stopped and again without being moved 8 min. later. The curve of foam specific gravity plotted against beating time showed a sharp drop at first, followed by a flattening out after from 2.5 to 3 min. The photomicrographs showed that the longer the foam was beaten the smaller and more unstable were the bubbles. A decrease in the stability of the foam with length of beating was also shown by the amount of draining of 53 cc of the egg white through filter paper in a 135-mm funnel covered with a watch glass. Changes in temperature from 20° to 34° C. did not affect the foam stability.

The effect of the age of the egg on the foam stability was tested by keeping eggs from the same lot for various periods of time up to nine days and conducting draining tests after beating for different lengths of time. The data thus obtained showed that when beaten equal lengths of time, increasingly unstable foams were produced the older the eggs. The specific gravity of the foam produced on beating for any given period was in almost every case progressively lighter the older the eggs.

A large number of batches of egg whites, including whole mixed white, thick and thin separated white, and whole white from eggs of different ages, were beaten and various measurements made on the resulting foam, including, in addition to other tests already mentioned, measurements of viscosity reported in centipoises and determinations of grams of insoluble protein. This value was obtained by allowing the foam to drain for 18 hr. and then washing it vigorously with a total of from 500 to 1,000 cc of distilled water on a weighed filter paper in a Büchner funnel, drying at room temperature, and weighing. As the principal measure of foam stability, the maximum rate of draining expressed in grams per minute was used. This value is variously expressed in the publication as rate of draining, slope, and foam stability. Data are given showing that within the limits of experimental error there is a linear relationship between foam specific gravity and stability, that the stability is affected both by the viscosity and specific gravity, that the insoluble protein increases with decreases in specific gravity and stability, that heat treatment of the egg white up to a temperature of 50° C. for 30 min. has no effect on the foam but higher temperatures decrease its stability, that neither the viscosity nor the stability of the foam is affected by the radius of curvature of the beater or its beating edge, that the addition of egg yolk in quantities of from 0 to 3 drops per 53 cc of the white has no effect on its stability,

and that variations in altitude from 5,000 to 10,000 ft. have no effect on foam behavior.

The first chemical factor to be studied was the effect of various amounts of potassium acid tartrate on the stability of egg foam beaten for 2 min. The addition of this acid salt was found to increase the foam stability to a considerable degree. Other acids were also found to produce the same effect in varying degree. In an attempt to find an explanation for this stabilizing effect, the specific gravity, rate of draining, viscosity, pH, and in some cases the surface tension were determined for the foams treated with potassium acid tartrate, acetic acid, and citric acid. The addition of any of these materials resulted in a decrease in the pH of the egg white draining from the foams. The foam stability reached a maximum at pH 8. On adding more of the acid the pH was reduced still further, with accompanying decrease in stability in the case of the foams treated with acetic or citric acids but not with potassium acid tartrate. The viscosity likewise increased with the addition of the acids to a maximum at pH 8.5 to 8, and then decreased for all of the acids. There was no significant difference in the amount of soluble protein obtained with these changes in pH, nor did the values for surface tension change significantly.

Small changes in viscosity, produced by extending the beating time, brought about a greater change in the rate of draining of foams produced from egg white in the presence of than in the absence of acid. The foams produced in the presence of potassium acid tartrate contained more nitrogen or protein than those produced in its absence.

A sample of commercial dried egg white was regenerated by soaking in water to give a solution with a nitrogen content approximately the same as that of fresh eggs and the regenerated white was beaten with various amounts of acetic acid and a small amount of sodium hydroxide. None of the treatments affected the foam stability or the viscosity of the material draining from the foam.

Foams produced from egg whites with small amounts of yolk in the presence of potassium acid tartrate were much more unstable than in the absence of the yolk. The addition of Na_2SO_4 , $\text{Ca}(\text{OH})_2$, or NaOH had no effect on foam stability, nor did the addition of $\text{Ca}(\text{OH})_2$, in quantities sufficient to neutralize the potassium acid tartrate, decrease the stability of the foam even when the acid and base were added alternately. When potassium acid tartrate was added at different times during the beating period the best results were obtained when the acid was added at the beginning of the period. Finally, a number of batches of egg white were beaten with three types of hand beaters and the same tests were made on the foam characteristics. The rates of draining calculated from viscosity were in fair agreement with experimental values, but those calculated from specific gravity were in every case different from the values obtained with the use of the electric beater.

In conclusion, the sources of error in the measurements made are discussed and the data are interpreted from the standpoint of the characteristics of egg-white foam and as far as possible from the standpoint of the practical application of the findings in the selection of eggs for commercial and domestic cakemaking. An extensive literature review and bibliography are included.

The nutritive value of the mountain apple, *Eugenia malaccensis* or *Jambosa malaccensis*, C. D. MILLER, R. C. ROBBINS, and K. HAIDA (*Philippine Jour. Sci.*, 53 (1934), No. 3, pp. 211-221, pl. 1, figs. 3).—In this contribution from the Hawaii Experiment Station, the mountain apple, "a refreshing

fruit of the tropical islands of the Pacific Ocean", is described, with photograph, and data are reported on its proximate and mineral composition and qualitative vitamin values.

Average values obtained in two analyses of the fruit were moisture 91.54 percent, protein ($N \times 6.25$) 0.33, ether extract 0.06, crude fiber 0.8, ash 0.26, carbohydrate by difference 7.01, acid as citric 0.15, calcium 0.007, phosphorus 0.013, and iron 0.00038 percent, and reducing sugars and sucrose none.

The fruit was found to be a relatively poor source of vitamins A, B, C, and G.

A study of the composition of human milk: The influence of the method of extraction on the fat percentage, S. T. WIDDOWS and M. F. LOWENFELD (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1400-1410).—In this extension of an investigation noted previously (E. S. R., 64, p. 283), a study was made of the fat content of human milk throughout the whole course of lactation, particular attention being paid to the percentages of fat in the milk when obtained by digital expression and by gentle suction with a breast pump. Analyses were also made of milk which had dripped from the breast. Included among the data reported are some of the results of the earlier studies.

Pressure proved to be the most important factor in the production of milk with a high percentage of fat. Factors influencing the percentage of fat in samples extracted by the same method (either by digital pressure or breast pump) are the period of lactation (the percentage of fat increasing between the first and fourteenth day), the individuality of the woman, and sudden changes in the volume of milk.

Percentage of fat in human milk: Influence of the method of extraction, M. F. LOWENFELD, S. T. WIDDOWS, and H. H. C. GREGORY (*Lancet [London]*, 1934, I, No. 19, pp. 1003, 1004).—After investigating the milk of 51 mothers and determining the fat content of 294 samples extracted by methods described in the paper noted above, the authors conclude that "in any given sample of milk, other factors being equal, the percentage of fat present will depend inversely on the quantity of milk in the breast at the time of taking the sample and directly upon the degree of pressure exerted upon the areola and nipple in the process of extraction. The practical use to which the above facts have led has been in the treatment of certain clinical difficulties occurring in connection with breast-fed infants."

Two types of difficulties are described. In one of these the infant secures milk of too high fat content as the result of vigorous suckling from a none too plentiful supply. The other represents the opposite condition, a milk supply so abundant that the infant does not have to suckle vigorously enough. The first is remedied by administering boiled water before and during the nursing period, or by preventing the infant from taking the strippings. The other condition is remedied by lengthening the interval between feedings so that the infant will suckle more vigorously, or by withdrawing some of the milk before nursing.

The nutritional aspects of milk pasteurization, E. V. MCCOLLUM (*Amer. Jour. Pub. Health*, 24 (1934), No. 9, pp. 956-958).—This report, presented before the nutrition section of the American Public Health Association at its 1934 meeting, consists chiefly of a review of recent literature, which, according to the author, "should finally silence the critics of pasteurized milk."

Changing concepts of nutrition, J. S. MCLESTER (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 6, pp. 383, 384).—The changing concepts discussed are chiefly those concerning the nutritive needs of the sick person. These are illustrated

by the changes which have taken place in diet recommendations for typhoid fever, gastric ulcer, nephrosis, Bright's disease, vascular hypertension, diabetes, tuberculosis, and chronic arthritis. "Formerly, in planning the patient's food, physicians thought solely in terms of the local pathologic condition, of the harm they might do some impaired organ; now they think chiefly in terms of general physiology, of the good they can do the patient as a whole."

Attention is also called to the wide variety of foods given infants at the present time, and, finally, the prediction is made that there will be dietary changes in the obstetric practice of the future, particularly as regards restriction of protein and of all food. It is pointed out that "during pregnancy the woman needs, more than at any other period of her life, an abundant diet which provides in adequate amounts all necessary food factors, not only carbohydrate and fat but proteins, vitamins, and minerals as well. To deny her this, even in small degree, is to court disaster."

Diet and personality, L. J. BOGERT (*New York: Macmillan Co., 1934, pp. IX+223*).—This volume, which contains an introduction by L. B. Mendel, gives suggestions in simple nontechnical terms concerning diets for slender and stocky people, for active and sedentary people of medium build, for the overweight and underweight, for those who are susceptible to infections, and for those who suffer from indigestion or constipation. There are also chapters on nervous strain, city perils (lack of exercise, fresh air, and sunshine), the importance of posture, food and health habits, and the food faddist.

The control of carbohydrate metabolism, J. J. R. MACLEOD (*Bul. Johns Hopkins Hosp., 54 (1934), No. 2, pp. 79-139, figs. 13*).—A series of three lectures delivered under the Christian A. Herter Foundation at the Johns Hopkins University, January 23, 25, and 27, 1933.

Mental effort in relation to gaseous exchange, heart rate, and mechanics of respiration, F. C. and C. G. BENEDICT (*Carnegie Inst. Wash. Pub. 446 (1933), pp. 83, pls. 2, figs. 3*).—This is the complete report of an investigation noted essentially from another source (*E. S. R., 64, p. 298*).

Mental effort and metabolism (*Jour. Amer. Med. Assoc., 102 (1934), No. 7, p. 540*).—This editorial on the studies noted above closes with the assurance that "on the basis of all these carefully established observations, one may well agree with the conclusion reached by the Benedicts that mental effort per se is without significant influence on the energy metabolism. Mental achievement, therefore, need not be curtailed because of the high cost of living—at least so far as calories are concerned."

On natural colouring matters related to vitamins: Carotenes and flavines, R. KUHN (*Jour. Soc. Chem. Indus., Chem. and Indus., 52 (1933), No. 49, pp. 981-986, figs. 3*).—In this lecture, delivered at the 1933 meeting of the British Association for the Advancement of Science, the author reviews briefly the literature, consisting largely of contributions from his own laboratory (*E. S. R., 70, p. 566*), on the chemical constitution of the various carotenoid pigments and the distribution, isolation, vitamin activity, and biological behavior of the flavines (vitamin B₂?).

Evidence is summarized which suggests "for the first time a reversible relationship between a vitamin and an enzyme. One may imagine that vitamin B₂ is the exogenous precursor of the yellow oxidation enzyme. The formation of the enzyme is supposed to occur by combination of the flavine with a colloidal carrier. In this connection it is very remarkable that we have observed an excellent increase in growth of animals deficient in vitamin B₂ which have been given well dialyzed preparations of the yellow enzyme. Therefore, there

exist not only free vitamin B₂, which dialyzed easily, but also vitamin B₂ attached to carriers of high molecular weight, which cannot be dialyzed—just as in the case of the flavines.”

It is also shown that flavines can act as biological hydrogen acceptors with a great variety of substrates, including lactic acid and pyruvic acid. This property is thought to explain the action of vitamin B₂ as an intermediate substance in cell respiration.

Further evidence of the existence of Reader's vitamin B₄ (E. S. R., 65, p. 594) is afforded by the fact that crystallized lactoflavine, when first administered as a source of vitamin B₂ to rats on the basal diet of Bourquin and Sherman (E. S. R., 66, p. 410), proved completely inactive in doses as large as 50×10^{-6} g per day. When the diet was supplemented by vitamin B₄, the lactoflavine promoted good growth in doses as low as 5×10^{-6} g per day. “Crystallized lactoflavine is, therefore, the most active preparation of vitamin B₂ hitherto obtained. Whether the biological activity is due to the pigment itself should be further investigated. For the present, we can say that the vitamin activity remains not only after repeated crystallizations but also after purification by preparation of the chloroform-soluble acetyl compound and regeneration of the lactoflavine from this.”

Natural pigments and vitamins (*Jour. Amer. Med. Assoc.*, 102 (1934), No. 23, pp. 1944, 1945).—In this editorial discussion of the summary by Kuhn, noted above, the opinion is expressed that “with the final chemical characterization of ovoflavine and lactoflavine another of the vitamins [vitamin G] will have been completely identified. . . . The close connection between certain of the natural pigments and indispensable nutritional factors emphasizes again the wisdom of a wide choice of foods and of consuming some foods in the uncooked natural state.”

The biological relation between carotene and vitamin A, J. C. DRUMMOND and R. J. MACWALTER (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1342–1347, figs. 2).—In a further attempt to demonstrate the conversion of carotene into vitamin A in the animal body (E. S. R., 70, p. 878), carotene was injected into the portal circulation of rabbits after a portion of the lobe of the liver had been removed aseptically under ether anesthesia. After a certain number of days, varying from 1 to 20, the animals were killed. The excised portion of the liver and a portion from the same lobe after the treatment were analyzed for vitamins A and D spectroscopically. There was no evidence of an increase in the vitamin A content of the liver until 8 days after the injection of the carotene. There was some loss of carotene, although not nearly as much as previously observed with cats.

The authors conclude that the formation of vitamin A may have occurred earlier than 8 days, but that it was either utilized and converted into another substance or formed in too small amounts to be detected by the technic used.

Further attempts to reproduce the conditions under which Olcott and McCann (E. S. R., 66, p. 607) observed the conversion of carotene into vitamin A are reported, but with negative results.

Carotenoids and the vitamin A cycle in vision, G. WALD (*Nature* [London], 134 (1934), No. 3376, p. 65, fig. 1).—In this extension of the author's observations on the occurrence of vitamin A in the eye tissues of various animals (E. S. R., 70, p. 877), a brief report is given of an examination of the carotenoids of the frog's eye, with a diagram illustrating the elements of visual purple vision in this animal. Evidence is presented leading to the conclusion that visual purple is probably “a conjugated protein in which vitamin A is the prosthetic group.” It is pointed out that, since the ultimate source of vitamin

A in any vertebrate is in the diet, "this is, at least in part, the reason for the failure of the visual purple mechanism (night blindness) in avitaminosis A."

Fish liver oils rich in vitamin A, J. A. LOVERN (*Nature* [London], 134 (1934), No. 3385, p. 422).—It is noted briefly that samples of sturgeon (*Acipenser* sp.) liver oils have been found to resemble halibut liver oil in varying widely in vitamin A potency, with some samples having a very high potency. The best sample examined had a value of 4,000 blue units in the antimony trichloride test for 0.2 cc of a 20 percent solution.

Three samples of the liver oil of the tunny (tuna) fish (*Thunnus thynnus*) caught off Scarborough, England, gave blue values of 1,927, 1,993, and 2,724 units, showing that tuna fish oil is relatively rich in vitamin A. The livers contained from 20 to 25 percent of oil.

Vitamin A and colds, E. L. and F. W. GARDNER (*Amer. Jour. Diseases Children*, 47 (1934), No. 6, pp. 1261-1264).—In this study, carried out at Loma Linda, Calif., two groups of 25 children each from 6 to 14 yr. of age were paired as to sex and as nearly as possible as to age, nutritional condition, and susceptibility to colds. Each member of group I was given daily one capsule of haliver oil (plain) containing at least 8,500 units of vitamin A. An additional group of 5 children was given 10 drops each of haliver oil representing 1,000 units of vitamin A. The members of group II were placed on a diet so selected as to furnish about 10,000 units of vitamin A daily. The range of intake, as calculated from food records kept by the mothers, was from 6,000 to 12,000 units daily. A control group of 25 children received no treatment or special diet. Owing to the desire of the parents to place all children who were most susceptible to colds in the experimental groups, the children in the control group in general were those who had a much higher natural resistance to colds.

The experiment began on November 20, 1932, and continued for 12 weeks, during which the occurrence of colds and the other essential data were reported weekly by the mothers. The children were weighed and measured at the beginning and end of the experiment. The mothers also filled out a questionnaire at the end of the period.

The numbers completing the test were 28 for group I and for those receiving additional haliver oil, 19 for group II, and 22 for the control group. Of these, 75 percent of group I, 69 percent of group II, and 14 percent of group III were considered to be susceptible to colds. During the experimental period the average number of colds per child was practically the same for the three groups, 1.5, 1.6, and 1.6, respectively. In the haliver-oil groups the colds during the experimental period were considered less severe than before in 53 percent and less prolonged in 40 percent of the entire number. Corresponding figures for group II were 36 and 27 percent. The average gains in weight for each child were 0.23, 0.24, and 0.15 lb. per week, respectively. In group II the beneficial effects were most apparent among those whose intake of vitamin A was the highest, with possibly two exceptions. The diets of these two were found to be definitely lacking in foods containing vitamin C. The children whose diets included liberal amounts of milk and greens showed a satisfactory gain in growth and increased resistance to colds. In the control group there were 3 children who had no colds during either the preliminary or experimental period. The diet in each case was found to be well balanced, with an abundance of spinach, carrots, and tomatoes.

The authors conclude that "haliver oil or a balanced diet including an abundance of foods containing vitamin A plays a definite role in decreasing the incidence and severity of colds among school children. Increased resistance is ac-

accompanied by a higher degree of general health, as is shown by an increase in weight."

On the effect of linoleic acid and yeast upon the growth of rats on high fat diet, Y. SAHASHI (*Bul. Agr. Chem. Soc. Japan*, 10 (1934), No. 4-6, pp. 82-86, figs. 9).—Data are given on the specific gravity, refractive index, acid, saponification and iodine values, and vitamin A content (+ values) of samples of butter, beef fat, lard, cod-liver oil, blubber and intestine oils of the finback whale, soybean oil, white sesame oil, peanut oil, coconut oil, palm oil, and olive oil.

These fats and oils were also tested on rats in diets in which the fat comprised 15 or 20 percent of an otherwise satisfactory diet. The rats failed to grow satisfactorily on all of the diets except the one containing butter. When the same diets were supplemented with 50 to 100 mg of linoleic acid per rat per day, growth was satisfactory on all the diets except the one containing cod-liver oil. This is thought to demonstrate anew the importance of linoleic acid as a dietary element.

Comparative determinations of the antineuritic vitamin content of rice made by experiments on the rice bird and by the rat tests, J. P. SPRUYT (*Arch. Néerland. Physiol. Homme et Anim.*, 19 (1934), No. 2, pp. 295-300).—Determinations of the vitamin B₁ content of six samples of rice, using ricebirds and rats, in both cases with the international vitamin B₁ standard in comparison, are reported with almost identical results.

Vitamin B₂ and the pellagra-like dermatitis in rats, P. GYÖRGY (*Nature [London]*, 133 (1934), No. 3361, pp. 498, 499).—In this preliminary report evidence is summarized briefly, leading to the conclusion that the antidermatitis factor in what was formerly called vitamin B₂ is not contained in the vitamin B₂ as isolated in flavone pigment. "This antidermatitis factor cannot be identical with vitamin B₄ for the following reasons: (1) Our animals show no signs of B₄ deficiency; (2) the skin lesions can be alleviated by alkaline autoclaved marmite in which, according to Reader, the vitamin B₄ must have been destroyed. One might rather identify it with the alkali-stable factor Y of H. Chick and A. M. Copping [*E. S. R.*, 65, p. 592] or the B₅ pigeon factor. In order to avoid confusion, we have for the time being named this 'rat pellagra preventive factor' in its narrow sense vitamin B₆."

The vitamin content of Philippine foods.—II, Vitamin C in various fruits and vegetables, A. J. HERMANO and G. SEPULVEDA, JR. (*Philippine Jour. Sci.*, 53 (1934), No. 4, pp. 379-390, pl. 1, figs. 16).—In this continuation of the series of studies noted previously (*E. S. R.*, 63, p. 692), the vitamin C values of 15 kinds of fruits and leafy vegetables purchased in the public markets of Manila were determined in curative tests on guinea pigs. The fruits were prepared by cutting the pulp in fine pieces, grinding thoroughly in a porcelain mortar, and squeezing through cheesecloth. The vegetables were for the most part fed in the fresh state. In general the materials to be tested were fed in only one dosage.

Of the fruits tested, the sugar apple (*Annona squamosa*), in doses of 10 cc of the strained pulp and juice of the matured ripe fruit, promoted growth at an average rate of 4.74 g daily and was pronounced an excellent source of vitamin C.

Soursop (*A. muricata*), which brought about an average daily gain of 4.21 g when fed in 8-cc doses, was also considered an excellent source of vitamin C. The Mango (*Mangifera indica*) and the mandarin (*Citrus nobilis*) were classed as very potent sources of vitamin C. In two tests of the mango, doses of 6.7 g daily brought about gains in weight of 4.98 and 7.14 g daily, and in a single

test of the mandarin 5 g, a gain of 5.19 g. Lanzones (*Lansium domesticum*) contained vitamin C in small amounts, 10 cc of the material inducing a gain of only 2.15 g daily.

The leafy vegetables were all fed in 10-g quantities, using the leaves and in most cases the tender shoots. Vinespinach (*Basella rubra*), kankong (*Ipomoea reptans*), amaranth (*Amaranthus viridis*), lettuce (*Lactuca sativa*), Chinese cabbage (*Brassica chinensis*), and jute leaves (*Corchorus olitorius*) were all considered excellent sources of vitamin C, causing gains of between 5 and 6 g daily. Chili leaves (*Capsicum frutescens*), Chinese mustard (*B. integrifolia*), and an edible fern (*Athyrium esculentum*) contained no appreciable amounts of vitamin C.

Glutathione and vitamin C in the crystalline lens, E. I. EVANS (*Nature [London]*, 134 (1934), No. 3379, pp. 180, 181).—It is noted briefly that an examination of the ascorbic acid content of the crystalline lens by the indophenol titration method of Tillmans indicated that the lens contains about 0.26–0.46 mg ascorbic acid per gram, but that doses of 2.5, 3.5, or 5 g of fresh crystalline lens added daily to the scorbutic diet of guinea pigs did not support growth or prolong the survival period. This is thought to indicate that the crystalline lens contains only small amounts of ascorbic acid. The absence of free cysteine or cystine was also demonstrated.

Glutathione and vitamin C in the crystalline lens, T. W. BIRCH and W. J. DANN (*Nature [London]*, 134 (1934), No. 3384, p. 383).—In reply to the claim of Evans, noted above, that the crystalline lens contains only an insignificant amount of ascorbic acid, attention is called to the difficulty in using the lens in curative or prophylactic biological tests on account of a toxic action. On using the tooth structure method and administering the material separately instead of with the diet, the presence of ascorbic acid in considerable amounts has been demonstrated. Attention is also called to the fact that the iodine titration of the lens extract measures the content of glutathione and indophenol-reducing substances together instead of glutathione alone.

Synthesis of vitamin C by the infant, P. ROHMER, U. SANDERS, and N. BEZSSONOFF (*Nature [London]*, 134 (1934), No. 3378, pp. 142, 143, fig. 1).—The authors note briefly that tests of the urine of infants for vitamin C by the Bezssonoff color reagent (E. S. R., 51, p. 714), which has been standardized against pure crystalline ascorbic acid, showed wide variations with age and diet. "Like the rat and the bird, the human infant possesses the faculty of producing vitamin C. This faculty, markedly evidenced up to the age of 5 mo., is afterwards diminished and disappears in infants of 14 mo. or above. It should be mentioned that the excretion of vitamin C in the urine often ceases in sick or dystrophic infants."

A comparison of solar ultraviolet radiation in Baltimore and Bogota, A. P. CHAVARRÍA and P. GOMEZ-VEGA (*Amer. Jour. Hyg.*, 20 (1934), No. 2, pp. 508–512, fig. 1).—Measurements of solar ultraviolet radiation made by the zinc sulfide method in Bogota, Colombia, are compared with the results reported by Clark for Baltimore, Md., using the same method (E. S. R., 65, p. 96).

"In Bogota there are two periods of maximum intensity during the year, one in the spring and one in the autumn. Maximum values for clear days at noon are approximately the same as those obtained in Baltimore in July (6,000 e per square centimeter per second), but during the winter minimum, which is more pronounced than the summer minimum, the energy does not fall below 2,000 e per square centimeter per second, which is four times as great as the midwinter intensity in Baltimore."

A specific dietary factor for lactation, W. NAKAHARA, F. INUKAI, and S. KATO (*Imp. Acad. [Japan] Proc.*, 10 (1934), No. 5, pp. 268-270).—In this preliminary report, data are summarized leading to the suggestion that the lactation-promoting substance shown to be absent from the synthetic diet previously described (E. S. R., 71, p. 420) is not related to the vitamin B complex. On supplementing the diet with a concentrate of acidified 60 percent alcohol extract of beef liver, an adsorbate of this fraction on acid earth, and the nonadsorbable fraction obtained by filtration, considerable success in lactation was secured with the whole extract and the nonadsorbable fraction but not with the adsorbate. The percentages of young in the first litters weaned at the age of 21 days were 1.02 percent for the basal diet alone, 41.02 percent for the diet supplemented with the whole extract, 9.83 percent for the diet supplemented with the adsorbate, and 57.50 percent for the diet supplemented with the nonadsorbable fraction.

The authors suggest that "the lactation promoting substance of liver may constitute a new dietary principle, for which we propose the designation of 'lactation factor' or 'factor L'. It seems probable that this lactation factor is present in yeast, rice polishings, etc., but in so small an amount that very large quantities of these materials are required to support lactation as observed by previous workers."

Dietary depigmentation of young rats, F. J. GORTER (*Nature [London]*, 134 (1934), No. 3384, p. 382, figs. 2).—It is noted briefly that young black (or hooded) rats on a ration containing much carbohydrate, vitamin B₁ as the acid clay standard, B₂ furnished by egg white or horse flesh, A and D as a standardized cod-liver oil, McCollum salt mixture, and the necessary amino acids in the form of casein, egg white, or horse flesh frequently show symptoms of yellowish depigmentation of the fur after about 2 mo. The symptoms are less pronounced if the carbohydrate contains much cellulose, and develop more rapidly if the diet contains much fat or sugar.

Among a number of foodstuffs tested for curative properties, lemon juice effected partial cure in one of several rats and slight improvement in two others. Whole yeast brought about slow cure, which was complete in about 2 mo. When the yeast was omitted depigmentation again took place almost immediately, sometimes with loss of fur on the head, neck, and back.

Various suggestions are given relating the phenomenon described to possible vitamin deficiencies. The diet used was thought to be deficient in the pellagra-preventive factor B₃ of György noted on page 282 or the growth factor Y of Chick and Copping (E. S. R., 65, p. 502). The possible relationship to pellagra is also suggested by the symmetrical distribution of returning pigment and by the alleged relation, as noted by Leader (E. S. R., 64, p. 595), between pellagra and diets rich in sugar.

TEXTILES AND CLOTHING

Properties of knit underwear fabrics of various constructions, C. H. HAMLIN and R. K. WORNER ([U. S.] *Bur. Standards Jour. Res.*, 13 (1934), No. 3, pp. 311-329, pls. 2, figs. 7).—The thermal transmission, air permeability, thickness, weight, compressional characteristics, and coefficient of friction, measured under specified conditions, are recorded for 97 representative underwear fabrics of given constructions and fiber compositions. Interrelations between properties are shown graphically with the constructions and fiber compositions of the individual fabrics indicated. In general the thermal transmission and air permeability of these fabrics varied inversely with thickness

and with weight, the total compression varied directly with thickness, and the compressibility varied directly with density. The coefficient of friction was lowest for fabrics made from continuous filament silk and rayon yarns. It was evident, however, that when any one property is fixed the other properties may be varied considerably.

Quality guides in buying ready-made dresses, C. L. SCOTT (*U. S. Dept. Agr. Leaflet 105 (1934), pp. 8*).—Suggestions are given for judging ready-made dresses for the quality of the fabric in cotton, silk, rayon, and other synthetic fabrics and wool, and also for quality of cut and workmanship. The principal points to look for when buying a dress are summarized as style and fabric suited to the needs; a label that tells what kind of fibers make up the material; definite information about shrinkage, weighting, or sizing, and color fastness to sunlight and washing; fabrics made of durable yarns, with firm, balanced weave; staple fabrics rather than novelties for economy; all pieces cut the right way of the goods; full cut with plenty of room; neat, appropriate, and serviceable workmanship; and allowances for alterations, particularly in growing girls' dresses.

The effect of dry-cleaning and mechanical cleaning upon furs, K. CRANOR, V. FISHER, A. SUNDT, L. PERRIN, A. MEYER, and V. CLARK (*Iowa State Col. Jour. Sci.*, 8 (1934), No. 3, pp. 427-447, pls. 5, figs. 7).—This is a progress report of research which is being conducted in the department of textiles and clothing at Iowa State College. The furs tested included Hudson seal, Northern seal, opossum, skunk, muskrat, beaver, squirrel, rabbit, fox, and raccoon. The furs were all cured by salt alum tannage, the samples used in the comparison of the two methods of cleaning were matched as closely as possible as to location and quality, and the cleaning was done in commercial establishments according to standard methods.

Of the nine tests made on the furs cleaned by both methods, six were in favor of mechanical cleaning (tossing in a cleaner drum with "Polar Bear Meal", a corn product)—ether-soluble content, breaking strength, elongation, thickness of pelt, abrasion, and length of hair. The other three tests, which were in favor of dry cleaning, were increase in gloss, diameter, and reflection factor. The better results obtained in these tests with dry cleaning were attributed to the paraffin-oil rinse.

Microphotographs of the hair structure of the different furs before and after cleaning are included, and show not only the effect of the cleaning process but also the wide differences in appearance of the more durable and less durable furs. "The less durable furs had large medullas and sharp scales. Beaver had the smallest medulla and rabbit the largest medulla in proportion to the cortex of any of the furs studied."

HOME MANAGEMENT AND EQUIPMENT

Living expenditures of a group of Illinois farm families, 1930, 1931, 1932, R. C. FREEMAN (*Illinois Sta. Bul. 406 (1934), pp. 365-406, figs. 6*).—In this study the same plan was followed as in an earlier study reported in Bulletin 372 (E. S. R., 66, p. 494). The report covers the analysis of 429 farm family records sent in to the University of Illinois for summarization during the 3-yr. period 1930 to 1932, inclusive. Of these records, 111 were for 1930, and 159 each for 1931 and 1932. Among them were continuous records for the 3-yr. period from 56 families.

For the three years 1930, 1931, and 1932, the averages for the number of members per family were 3.8, 3.9, and 4.1, respectively; the percentage of

owners, 63.5, 47, and 47 percent; the number of acres farmed per family, 202, 209, and 216; the number of rooms in the house, 8, 7, and 7.7; the realized income, \$2,190, \$1,791, and \$1,308; and the money value of commodities and services furnished by the farm, \$635, \$645, and \$560, respectively.

The lower income-groups put a higher proportion of their savings into life insurance, while the higher income-groups used other forms of investment to a greater extent. During the 3-yr. period there was a tendency to use savings to offset a declining income and to supplement the income where possible by working away from the farm. The amount of home-produced food increased considerably in 1931 over 1930 and only slightly in 1932 over 1931. The average daily food cost per adult male unit was 43 ct. in 1930, 40 ct. in 1931, and 31 ct. in 1932. Eight percent of the total realized income was used each year for operating expenditures. Cash expenditures for shelter decreased markedly in 1932 from those of the other two years, particularly in the highest and lowest income-groups. The average amount spent per family for repairs for the house dropped from \$39 in 1930 to \$10 in 1932, and furnishings and furniture from \$83 to \$26. The average expenditure per family for clothing declined 48 percent from 1930 to 1932, with a greater proportion of the decline in the wives' clothing than in the husbands'. Expenditures classed as general declined more than any other class.

The changes made during the 3-yr. period by the 56 families keeping accounts for the entire time corresponded closely with the general figures. The percentage reductions in total realized income and in available cash for family living were exactly the same—40 and 52 percent, respectively. In all of the items the percentage reductions showed close agreement, leading the author to conclude that the variations in the composition of the larger groups was not a significant factor in causing the variation in incomes and income distribution from year to year.

Arranged in decreasing order on the basis of the purchasing power of the dollar, the average retrenchments in expenditures from 1930 to 1932 were in recreation, gifts, automobile, savings, education, repairs and furnishings, church, operating, personal items, health, and clothing. Food consumption increased on account of the increase in home-produced food.

MISCELLANEOUS

International directory of agricultural experimental institutions in hot countries (*Roma: Internatl. Inst. Agr., 1934, pp. XV+563, figs 13*).—This supplements the publication previously noted (E. S. R., 69, p. 481) by a replacement of an earlier monograph (E. S. R., 66, p. 88). The material presented is extensively revised and published in parallel columns in French and English.

[Annual Report of Puerto Rico Insular Station, 1933], F. A. LÓPEZ DOMÍNGUEZ (*Puerto Rico Dept. Agr. and Com. Sta. Ann. Rpt. 1933, Spanish ed., pp. 125*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

[Miscellaneous papers from the Michigan Station] (*Michigan Sta. Quart. Bul. 17 (1934), No. 1, pp. 62, figs. 12*).—In addition to papers noted elsewhere in this issue or previously, there are included abstracts entitled Dissociation in Yeasts, by F. W. Fabian and N. B. McCullough² (pp. 51, 52), and A Portable Small Grain Thresher (describing a small thresher designed for threshing small grain from experimental plats), by A. G. Weidemann³ (p. 53).

² Jour. Bact., 27 (1934), No. 6, pp. 583-623, figs. 15.

³ Jour. Amer. Soc. Agron., 26 (1934), No. 4, pp. 346-352, figs. 2.

NOTES

Louisiana Station.—Dr. Alfred H. Meyer, associate soil technologist since 1929, died September 15, 1934, from injuries following an automobile accident. Dr. Meyer was born in Grafton, Wis., in 1888, graduated from the University of Wisconsin in 1911, and received the Ph. D. degree in 1927. He became associated with the U. S. D. A. Soil Survey in 1911, resigning to take charge of the soil survey of the University of Georgia in 1920. He was appointed associate professor of agronomy and associate agronomist in Clemson College and the South Carolina Station in 1927. At the time of his death he was serving as regional director of Louisiana projects in the Soil Erosion Service of the U. S. Department of the Interior.

American Society of Agronomy.—This society held its twenty-seventh annual meeting in Washington, D. C., November 22 and 23, 1934. The sessions were preceded by those of the American Soil Survey Association, held November 20 and 21, making a very full and comprehensive program for the week.

The address of the president, R. I. Throckmorton of Kansas, was entitled *The Responsibilities of Agronomists*. The view was expressed that "whether the agriculture of the country becomes definitely organized, regimented, or more stabilized through education, it seems that the scientists in the various fields of research in soils and crops are facing a period of increased activity and responsibility."

The address of the president, R. I. Throckmorton of Kansas, was entitled *Entists in agronomy should be true scholars, men of learning who have a broad vision and who can see the field of agriculture as a whole*. The educational trend of today, however, tends to produce men of skill and of high specific knowledge. Technical skill in working with plants or soils in the field, greenhouse, and laboratory is essential, but it is not enough. The agronomist must have not only skill in his technical field, but he must also have an eager and questioning mind if he is to be responsive to his obligations. He must also be able to appreciate and understand the relation of his problems and of his findings to the entire field of agriculture. The man who is intensively trained in a narrow field, regardless of how important that field may be, will not, unless he is an exceptional human being, be able to see the broader aspects of the results of his research to society." Moreover, "if agronomists are to be developed who can successfully meet the problems of the future, it will be necessary during their undergraduate days to do more than insist upon good training in the basic sciences and in agriculture. These men must be taught the importance of cooperating with other scientists, and they must be helped to understand how to work with others and to be tolerant of their ideas. This spirit and attitude must be developed during the undergraduate days, while the student's mind and reaction may be more readily molded to such a pattern. The spirit of cooperation has always been important but is rapidly becoming more essential in agronomic research. As more attention is given to fundamental research in agronomy the problems become more closely related to other sciences, and the cooperation of men in these related fields is necessary for their solution."

The report of the editor, J. D. Luckett of New York, showed that substantial publication difficulties had been largely overcome within the year with the

restoration of the normal space limits of the *Journal*, an exceptionally small carry-over of papers, and an interval between date of acceptance and date of publication of contributions reduced "to the lowest point practicable in the printing of a monthly magazine."

Announcement was made of the acceptance by the society of the administration of an annual award of \$5,000 offered by the Chilean Nitrate Educational Bureau for research in the importance of the rarer elements in agriculture.

The officers elected for the ensuing year included H. K. Hayes of Minnesota as president, R. M. Salter of Ohio as vice president, and R. D. Lewis of Ohio and C. E. Millar of Michigan as chairmen, respectively, of the sections of crops and soils. J. H. Parker of Kansas, F. D. Richey of the U. S. D. A. Bureau of Plant Industry, and R. M. Salter of Ohio were elected fellows.

Sixth International Botanical Congress.—The preliminary program for this Congress, to be held in Amsterdam September 2-7, 1935, includes the following topics: Agronomy—interactions between roots and soil, interactions between plants, virus diseases, weed flora as an indicator of soil conditions in agriculture, and grassland associations; cytology and genetics—structure of chromosomes, crossing over v. conversion, terminology of cytology and genetics, pairing of chromosomes in polyploids, reduction division in fungi, chain and ring formation of chromosomes, microscopical structure of the cell wall, vacuome, chondriome, and plastids, colloid chemistry of protoplasm, vital staining, experimental mutations, genetical basis of size and form, sexuality in fungi, genetics and breeding of immune varieties and inbreeding, taxonomy and genetics, plasm and genotype in their mutual relations, and lethal factors; geobotany, ecology, and phytogeography—climax associations in northwest Europe and North America, cartography, plant geography in younger formations, the halophyte problem, and classification and nomenclature of vegetation units; morphology and anatomy—size and form, genetical basis of size and form, phytohormones, leaf arrangements, flower morphology, female fructification and phylogeny of conifers, wood anatomy, relations between anatomy and external morphology, and morphology of bryophytes; mycology and bacteriology—differential characters in hymenomycetes, nomenclature of fungi, sexuality in fungi, reduction division in fungi, biologic forms of fungi, importance of microbiological investigations in the study of agricultural problems, and phylogeny and taxonomy of phycomycetes; phytopathology—biological basis of plant quarantine, virus diseases, immunization, and physiologic diseases; and plant physiology—photosynthesis, phytohormones, oxidation, reduction, and metabolism, permeability and the accumulation of mineral elements, sub-microscopical structure of the cell wall, translocation of plastic materials, and influencing the cycle of development in plants. Sections are also included on paleobotany and taxonomy and nomenclature.

New Journal.—*Lantbrukshögskolans Annaler* is being issued by the Agricultural College of Sweden at Uppsala. The initial volume contains the following articles in English, with Swedish summaries: Fat and Calcium Metabolism—[I] and II, by A. Westerlund (pp. 1-31); The Chemical Characteristics of Soil Profiles—I, The Podzol, by S. Mattson and Y. Gustafsson (pp. 33-68); and Continued Research upon Variation and Heredity of Some Characters in White Leghorns, Rhode Island Reds, and Barnevelders, by J. Axelsson (pp. 69-207). An article in Swedish, with English summary, is also included entitled Agricultural Chemical Factors Leading to Anemic Conditions with Local Occurrence in Northern Sweden, by O. Svanberg (pp. 209-250).

○

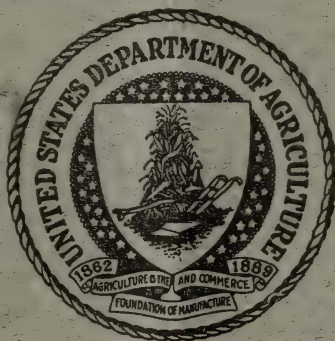
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 72

MARCH 1935

No. 3

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
(Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment—
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOL. 72, NO. 3

Editorial:	Page
Theobald Smith (1859-1934).....	289
Recent work in agricultural science.....	291
Agricultural and biological chemistry.....	291
Agricultural meteorology.....	297
Soils—fertilizers.....	298
Agricultural botany.....	306
Genetics.....	309
Field crops.....	315
Horticulture.....	326
Forestry.....	343
Diseases of plants.....	345
Economic zoology—entomology.....	356
Animal production.....	370
Dairy farming—dairying.....	375
Veterinary medicine.....	381
Agricultural engineering.....	393
Agricultural economics.....	401
Rural sociology.....	412
Foods—human nutrition.....	413
Textiles and clothing.....	424
Home management and equipment.....	425
Miscellaneous.....	429
Notes.....	430

EXPERIMENT STATION RECORD

VOL. 72

MARCH 1935

No. 3

EDITORIAL

THEOBALD SMITH (1859-1934)

In the words of a recent tribute in *Nature*, "with the death on December [10] of Dr. Theobald Smith, there has passed away a great figure in the science of animal pathology. Much of his life was spent in research on veterinary science, and his work illustrates the natural intimate connection between human and veterinary medicine, for his researches were of so accurate and fundamental a character that they made far-reaching additions to knowledge of disease both in man and the lower animals. The breadth of his outlook was remarkable, and many branches of pathology have been enriched by his keen insight."

A distinguished speaker at Dr. Smith's funeral pointed out that he was the originator and the builder of the opportunities and the fields in which he worked. His long public service began with his appointment in 1884 in charge of investigations of infectious animal diseases in the newly created Bureau of Animal Industry of the U. S. Department of Agriculture. He left the Department in 1896 to become director of the pathological laboratory of the Massachusetts State Board of Health and built up both this laboratory and the department of comparative pathology in Harvard University. In 1914 he was selected to organize and direct the recently established department of animal pathology of the Rockefeller Institute, located at Princeton, N. J., retiring as director emeritus in 1929. At essentially all stages his work was that of a pioneer.

Dr. Smith's period of productive activity covered approximately half a century, but the discovery with which his name is most widely associated came at the beginning of his career. This dealt with the role of the cattle tick in the spread of Texas fever. In 1889, with his coworker Dr. F. L. Kilborne, director of the B. A. I. Experiment Station, he accurately described the causal protozoan responsible for the disease, and in 1893 they showed that it was transmitted from one animal to another by the progeny of cattle ticks which had lived on infected cattle. In this way it was proved conclusively for the first time in history that the essential etiological factor of an infec-

tious disease may be a microparasite that reaches its victims only through an intermediate host. In the words of President Thomas of Rutgers College, this fundamental discovery "approaches in importance the pioneer work of Pasteur . . . , providing a new approach to the study of communicable diseases and placing agriculture forever in his debt by saving the cattle industry of the South and Southwest." Probably of greatest importance was its contingent bearing on the combating of such human diseases as malaria and yellow fever.

Other early studies dealt with the bacteria associated with specific diseases. Among these were hog cholera and swine plague, in connection with which the first attempt was made to immunize with killed bacterial cultures; his differentiation of a number of strains of tubercle bacilli and the forms of the disease which they produced; and his observations, reported in 1895-96, of scurvy in guinea pigs following their maintenance on oats and bran without green feed.

Nature points out that many of his findings were of striking originality, although they were often unheeded and rediscovered later by others. "The discovery of new phenomena," according to that journal, "appears to have been his chief interest, though the subjects at which he worked had eminently practical aims, and his career illustrates the fundamental value of informed and intensive observation by those engaged in work on practical issues."

Recognition of the full significance of much of Dr. Smith's work was frequently belated, but he lived to see it widely known and generally appreciated. He was the recipient of many honors in this country and abroad, including a long list of honorary degrees from some of the world's great universities, membership in the National Academy of Sciences, the Royal Society of Great Britain, and many others, and the Copley Medal of the Royal Society and the Manson Medal of the Royal Society of Tropical Medicine. His death brought forth many striking encomiums upon his achievements, but perhaps none was more appropriate than the following tribute of President Eliot of Harvard University upon his departure from that institution in 1915: "I have felt under great obligations to Dr. Smith ever since I first made his acquaintance 20 yr. ago. He has stood for me ever since as completely satisfying my ideal of the type of modern scientist—simple, diligent, loving truth, seeking truth, but seeking it for the promotion of the welfare of mankind."

The constructive influence of such a career will not soon be forgotten.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies on the combinations of certain amino acids and proteins in the solid state with certain gaseous acids and bases, E. J. CZARNETZKY and C. L. A. SCHMIDT (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 301-317, figs. 3).—The combining capacities of a number of amino acids, proteins, and some related compounds were determined by means of a gasometric titration of which the end point consisted in the sudden break in the partial pressure curves of the gaseous acids and bases used at the moment of completion of the stoichiometric reaction which, within certain limiting conditions, was found always to take place.

"It was found possible to correlate roughly the combining capacities of certain proteins in the dry state for ammonia with the content of free carboxyl groups. The combining capacities of certain proteins for hydrogen chloride are approximately determined by the content of ϵ -amino nitrogen of lysine, the imino nitrogen of tryptophan, the guanidine group of arginine, the tertiary and imino nitrogen groups of histidine, and the tertiary nitrogen of the —CON— groups (based on the content of proline and hydroxyproline).

"On the basis of the phase rule diagrams, it is concluded that the combinations between the solid proteins cited and hydrogen chloride as well as ammonia are chemical in nature and within certain limits take place in stoichiometric proportions. The change in heat content with dissociation, the change in free energy with dissociation, and the change in entropy with dissociation have been calculated for the ammonium and hydrogen chloride salts of certain amino acids in the solid state. The dissociation pressures of these salts have been determined at three different temperatures. Similar data are presented for the compounds formed by treating the hexone bases with hydrogen sulfide."

The stability of cystine in acid solution, K. SHINOHARA and M. KILPATRICK (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 241-251).—Cystine in solution in hydrochloric acid was found to be unstable, producing, on standing, a reducing substance which could be detected by means of a titration with iodine. In an atmosphere of nitrogen and at room temperature, the change became detectable after an induction period of about 7 days. The decomposition was observed to take place in the dark, also, and in the absence of iron and copper ions. "At 80° [C.] the change is more rapid, becoming distinct by the end of 6 hr. The reducing substance is mainly cysteine, the source of its production being the hydrolysis of cystine. An alkaline solution of cystine undergoes a similar change at a much faster rate."

A modified nitroprusside test for the determination of organic thiol compounds and a cobalt complex test for the determination of cysteine in the presence of cystine are described as follows:

"(1) *Modified nitroprusside test.*—Two cc of 0.2 M zinc acetate solution, then 2 cc of 1 M ammonium hydroxide solution, were added to 5 cc of test solution

cooled to 25°. To the solution 0.5 cc of 5 percent sodium nitroprusside solution was added, and the final mixture was shaken. The color was compared with the colors of a series of standards.

"(2) *Cobalt complex test*.—Two cc of 0.2 M cobaltous chloride solution were added to the 5 cc of the test solution cooled to 25°, and the mixture was then made strongly alkaline by the addition of 4 cc of 0.5 N sodium hydroxide solution. After thorough shaking 1 cc of 3 percent hydrogen peroxide solution was added, and the cobaltic hydroxide was removed by filtration or centrifuging. The brownish yellow color of the solution was stable for more than 12 hr. The final color was compared with the color of standards prepared in the same way."

The electric charge of the colloid particles of protoplasm, B. SEN (*Ann. Bot. [London]*, 48 (1934), No. 189, pp. 143-151, pl. 1, fig. 1).—The cataphoretic migration of the particles of living protoplasm in the single cells of the petiole hair of *Urtica dioica* and of the root hair of *Azolla pinnata* was observed in a hanging-drop preparation in dark-field illumination.

When the current passing through the water drop in which the cell was mounted was not permitted to exceed 15 μ a and was not applied for more than 5 sec. at a time, the protoplasm appeared not to be injured and the cataphoretic response of the same cell could be observed repeatedly. Larger currents or longer periods of application caused coagulation toward the anode. The potential applied was from 2 to 40 v, with similar results in all cases.

"These observations show that (1) the particles of protoplasm carry a negative charge, since their cataphoretic migration is always toward that end of the cell whose adjacent electrode is made the anode; (2) immediately at the 'break' of the current the particles migrate in the opposite direction; (3) when the intensity of the current is not such as to injure the protoplasm, these observations can be repeated several times on the same hair with reversal of the direction of current. Further, the velocity of cataphoretic migration of single particles of protoplasm of the *Azolla* root hair has been measured, and this velocity has been found to be independent of the shape and size of the particles."

Separation of cellulose particles in membranes of cotton fibers by treatment with hydrochloric acid, W. K. FARR and S. H. ECKERSON (*Contrib. Boyce Thompson Inst.*, 6 (1934), No. 3, pp. 309-313, figs. 2).—The microchemical method of removing noncellulose material from cotton cell walls by means of the less active pectin solvents became less effective when applied on a larger scale. Seeking a method which would yield larger quantities of the pure cellulose particles required, the authors found that "treatment of mature cotton fibers with HCl (sp. gr. 1.19) for periods ranging from 0.5 hr. to 5 days resulted in the removal, during the longer intervals, of the noncellulose constituents. Large quantities of cellulose in the form of particles were obtained for experimental purposes. Microchemical, optical, and X-ray diffraction analyses showed that the essential cellulose nature of the particles was unaltered."

X-ray diffraction patterns of cellulose particles and interpretations of cellulose diffraction data, W. K. FARR and W. A. SISSON (*Contrib. Boyce Thompson Inst.*, 6 (1934), No. 3, pp. 315-321, fig. 1).—Using separated and purified cellulose particles obtained by means of the method of Farr and Eckerson, above noted, the authors found that this material, "when pressed into pellets and mounted upon an X-ray diffraction apparatus, gave a typical Debye-Sherrer cellulose pattern. When the particles were treated with 18 percent NaOH a pattern characteristic of mercerized cellulose was obtained.

"Certain X-ray diffraction phenomena which heretofore have seemed to necessitate the assumption of the existence of hypothetical submicroscopic micellae are explained equally well by these microscopically visible particles of cellulose, observable as units in the young cotton fibers but united in the later stages of growth by noncellulose cementing substances to form fibrils in which the cellulose particles can no longer be seen as individuals."

Some physico-chemical properties of lactose, I, II, B. L. HERRINGTON (*Jour. Dairy Sci.*, 17 (1934), Nos. 7, pp. 501-518, figs. 5; 8, pp. 533-542, figs. 3).—Results of a series of investigations are reported.

I. The spontaneous crystallization of supersaturated solutions of lactose.—It was found that lactose solutions could be supercooled greatly without crystallization taking place, and in the absence of agitation the degree of supercooling necessary for crystallization was less for concentrated than for dilute solutions. There was no sharp dividing line between the metastable and labile zones in supersaturated lactose solutions. During the supercooling of a solution of lactose the rate of nuclei formation passed through a maximum, the temperature for the most rapid formation being higher in the case of concentrated solutions.

The rate of crystal growth passed through a maximum as the temperature was lowered. In the absence of agitation at low temperatures the rate of crystallization was so slow that mutarotation could not be the limiting factor. Lactose solutions could be so greatly supersaturated that they resembled solids, at room temperature if protected from moisture. Lactose glasses were hygroscopic, absorbing moisture from the air until dilute enough for crystallization to take place. These glasses were supersaturated with both alpha hydrate and beta anhydride. Lactose glasses, when desiccated, lost part of their moisture quickly and came to an apparent constant weight, but the removal of the last portions of water from such glasses was very slow. Precipitating lactose with alcohol did not produce equilibrium lactose. Alpha lactose was more readily precipitated from solutions by alcohol than beta lactose. Precipitated lactose varied in composition and usually contained more alpha lactose than was present in the equilibrium moisture.

II. Factors influencing the crystalline habit of lactose.—The crystalline habit of alpha hydrate was found to vary greatly under different conditions of crystallization. The principal factor governing this habit was the precipitation pressure, the ratio of the actual concentration to the solubility. When this ratio was varied, a great variety of crystals were produced. Sucrose did not have a specific action upon the crystalline form of lactose, but it did have a precipitating effect upon that sugar. Both alpha hydrate and beta anhydride formed needles if crystallized rapidly. The two could be readily distinguished, however, by the fact that the prisms of alpha hydrate were always straight and those of beta anhydride curved.

The physiologico-biochemical principles of tobacco curing and fermentation, A. I. SMIRNOV (*Fiziologo-biokhimicheskie osnovy obradotki tabachnogo syr'ya*. Krasnodar: Vsesoiuzn. Inst. Tabach. Promysh., 1933, pp. XIV+507, pls. 2, figs. 36; Eng. abs., pp. 485-499).—A short introduction discusses briefly the peculiar properties of tobacco as a commercial product, the difficulty of an objective appreciation of the commercial value of tobacco, "curing" and "fermentation" considered as processes creating the quality and peculiar features of a given commercial type of tobacco, the correlation of the changes undergone by tobacco leaves during their life and of those during the successive processes necessary for their preparation, the empirical character of practical methods of curing tobacco material and the importance of scientific research concerning this problem, and the scope of the present monograph.

Part 1, on ripening of tobacco leaves, contains chapters on dry matter of tobacco leaves and its water-holding capacity, the maturing of leaves as shown by changes in their carbohydrate group, nitrogenous substances, organic acids, and other components of tobacco leaves. Part 2, on curing, takes up the state of tobacco leaves at the harvesting time and changes occurring in them after they have been harvested, curing of tobacco without artificial heat, use of artificial heat for the curing of tobacco, use of artificial air conditioning for tobacco curing, dry matter, water content, and mineral substances of tobacco leaves in the curing process, carbohydrates and their changes, nitrogenous substances and their changes, ether extract, organic acids, and gaseous metabolism in tobacco, and coloring of tobacco and the influence of curing by entire plants and by primed leaves. Part 3, on enzymes, their content in tobacco, and their changes during the process of curing, deals with curing as process determining changes in the activity of enzyme complex of tobacco and enzymes of tobacco and their properties. Part 4, under the general head of fermentation of tobacco, contains chapters discussing changes occurring in tobacco in the period between its curing and fermentation in the warehouse, importance of the fermentation and methods used in tobacco industry, changes in the composition of tobacco during its fermentation, conditions of labor in tobacco warehouses briefly characterized and comparative survey of the physiological action of the smoking of different sorts of tobacco, microbiological hypothesis of the fermentation of tobacco and possibility of the development of micro-organisms on tobacco and control measures against them, chemical and biochemical character of the fermentation, and rationalized fermentation of yellow tobaccos and the process of aging.

The preparation of enzymatically pure proteinase and the quantitative determination of the influence of protaminase, L. WEIL (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 291-299, fig. 1).—A method for the preparation of enzymatically pure proteinase is given. For the quantitative determination of protaminase, a substrate and its preparation are described.

"Protaminase is activated by enterokinase. Proteinase requires no free amino or carboxyl groups for its activity. The substitution of these two groups shows no inhibition of the activity of proteinase."

The inactivation of pepsin, trypsin, and salivary amylase by proteases, H. TAUBER and I. S. KLEINER (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 411-414).—The authors found that pepsin and trypsin may be digested by each other if the proper H-ion concentrations are maintained. At pH 5.5, pepsin is inactive but is not destroyed. Therefore pepsin cannot attack trypsin at this pH, which is favorable to tryptic activity, and accordingly pepsin is readily digested by trypsin. If, however, a mixture of these two enzymes is kept at pH 2.0, the pepsin digests the trypsin, since trypsin is inactive at pH 2.0 but is not destroyed. Erepsin does not inactivate trypsin at pH 7.3, and this indicates that the trypsin molecule is relatively large.

Salivary amylase is also inactivated by trypsin, but at a slower rate than most of the other enzyme digestions which the authors have studied. Papain (activated by H_2S) inactivates salivary amylase more slowly than does trypsin.

"These results show that urease, maltase, rennin, pepsin, trypsin, and salivary amylase are of protein nature."

An apparatus for determining the rate of carbon dioxide production during yeast fermentation, K. W. FRANKE and A. L. MOXON (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 415-418, figs. 2).—A contribution from the South Dakota Experiment Station describes an apparatus of which the essential principle is that of the electrical counting of drops of a salt solution, displaced

by the carbon dioxide as it is evolved, as they drop between platinum points in a 45-v. battery-recorder circuit.

"The fermentation is carried out in a 100-ml wide-mouth bottle fitted with a 1-hole rubber stopper. This bottle is connected, by means of glass and heavy-walled rubber tubing, with a 500-ml bottle containing a 10-percent sodium sulfate solution. A 3-hole rubber stopper closes this bottle. The tube just through the stopper connects with the fermentation bottle. The second tube, reaching to the bottom of this bottle, is closed with a piece of rubber tubing and pinch clamp and is used to fill the bottle with the sodium sulfate solution and for saturating this solution with carbon dioxide. The last tube also reaches to the bottom. This is connected by heavy-walled tubing with the drop counter. . . . The tube containing the capillary is placed so that the drops leave the end of the capillary before touching the platinum points. As each drop falls between the tips of the platinum wires, it closes an electric circuit produced by a 45-v. dry cell. This operates a time marker to which a fountain pen, similar to those used on temperature recorders, has been attached. Each drop is recorded on a moving strip of paper (adding machine) on which 5-min. intervals are also recorded. . . . The size of the drops can be varied by using capillary tubes of different sizes. The total number of drops divided by the total volume in milliliters for each unit gives the average number of drops per milliliter."

A rapid chemical method for determining the readily available potash of soils, N. J. VOLK and E. TRUOG (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 537-546).—The authors of this contribution from the Wisconsin Experiment Station report a study of the relation between the readily available and the exchangeable potassium content of the soil, an investigation undertaken with the purpose of developing a rapid chemical method for the determination of the potassium requirement. The results are summarized as follows:

"Normal ammonium acetate of pH 6.8 was found to be more satisfactory as an extractant than other salt solutions and dilute acids, and the use of 15 parts of this extractant to 1 part of soil in 5 min. of intermittent handshaking resulted in an average extraction of 96 percent of the exchangeable potash." This method of extraction was adopted, a detailed procedure for readily available potash, involving precipitation and titration as the cobaltinitrite salt, being given. "With this method, an analyst can make 25 to 30 determinations per day.

"The results by the chemical method agreed with those by the Neubauer method [*E. S. R.*, 53, p. 319] on 72 samples in respect to positive or negative response to potash fertilization, and also correlated rather well with those by the Mitscherlich, the field plat, and the *Aspergillus niger* methods. The influence of kind of crop, subsoil, and climate must be considered in arriving at the minimum level of readily available potash for any particular case."

Quantitative determination of sulphur on leaves by titration, C. G. SMALL (*Phytopathology*, 24 (1934), No. 3, pp. 296-299, fig. 1).—In a contribution from Cornell University, the author reports upon a method consisting essentially of an extraction of the sulfur from the leaves with carbon tetrachloride, evaporation of the solvent and solution of the sulfur in an exactly known quantity of strong sodium hydroxide solution, oxidation of the sulfur compounds formed to sulfate by means of hydrogen peroxide, and titration of the excess sodium hydroxide with hydrochloric acid.

"Pour about 300 cc carbon tetrachloride into a larger beaker. Immerse about 40 leaves in the tetrachloride and let stand for 10 min. Turn the leaves over with a glass stirring rod and let stand for another 10 min. Remove the leaves a few at a time, pulling them out by the stems, and rinse in a second

beaker containing about 250 cc of carbon tetrachloride. Carefully shake off all droplets of the solvent and discard the leaves. Immerse successive 40-leaf portions of the sample in the first beaker and repeat the washing until all of the sample [about 150 leaves] has been treated. Filter the contents of both beakers through a thin tuft of absorbent cotton and place the filtrate in a 500-cc florentine flask. Rinse all beakers and the filter with clean carbon tetrachloride and add the rinsings to the flask. Place the flask on a hot plate and distill until the volume of the sample has been reduced to about 10 cc. . . . Heat the sample on a steam bath until all of the solvent has been removed.

"Add 5 cc of distilled water and make neutral to methyl red indicator, using approximately 0.1 N solutions of either hydrochloric acid or sodium hydroxide. Using a pipette, add 20 cc or more of a 2 N solution of sodium hydroxide, close the flask with a 'protection tube' . . . , and heat on the steam bath until there is no free sulfur remaining in the flask. Allow the sample to cool to room temperature, and then slowly add a 30 percent solution of hydrogen peroxide, using 5 cc for each 20 cc of sodium hydroxide. Heat on the steam bath for 3 to 5 hr., cool, and add a second portion of hydrogen peroxide. Heat again for 1 hr. and then allow to cool.

"Titrate the remaining sodium hydroxide against a standardized 1 N solution of hydrochloric acid, using methyl red indicator.

"Run a blank determination with each set of samples, using the same amount of sodium hydroxide as was used in the samples. Titrate this blank to determine the exact amount of sodium hydroxide used."

Starch determination methods involving solubility in acids, F. E. DENNY (*Contrib. Boyce Thompson Inst.*, 6 (1934), No. 3, pp. 381-393).—The Rask method (E. S. R., 57, p. 204), in which the starch is extracted from plant tissue by cold concentrated HCl, was found to be inaccurate if the starch were calculated from the weight of the alcohol precipitate but accurate if the precipitate were hydrolyzed with taka-diastase. Determinations of the starch of 12 different kinds of plant tissue, principally leaves, were made by a modified Rask method, use being made both of HCl and of H_2SO_4 , and these values were compared with those obtained by the calcium chloride method (in which the starch is extracted from the tissue by hot concentrated CaCl_2) and by the taka-diastase method (in which the enzyme is added directly to the tissue and the resulting increase in copper-reducing power is taken as a measure of the starch without subsequent acid hydrolysis of the enzyme digest). In certain tissues the same or similar starch contents were indicated by all four methods, but in other cases the taka-diastase values were much higher than were those obtained by the HCl, H_2SO_4 , and CaCl_2 extraction methods; a result taken as corroborating the view that the taka-diastase method gives starch values which are too high because of the hydrolysis by taka-diastase of nonstarch constituents, present in many plant tissues, into substances possessing a copper-reducing power.

The determination of carotene in butter fat, H. M. BARNETT (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 259-267, fig. 1).—A new spectrophotometric method for the determination of the carotene content of butterfat is based upon transmittancies at different wave lengths of varying amounts of pure carotene dissolved in butterfat.

"Determinations by the new method have been made on five samples of butterfat. Results ranged from 7.3 to 13 mg of carotene per kilo of butterfat. The new method was found applicable to other dilute solutions of carotene in oil. A comparison of determinations of the carotene content of various butterfats and of other oils by colorimetric and spectrophotometric methods was

made. A factor of 0.28 was obtained which may be applied to colorimetric determinations where a spectrophotometer is not available."

Making cider for roadside stands, D. K. TRESSLER (*Farm Res. [New York State Sta.]*, 1 (1934), No. 1, p. 5, fig. 1).—This brief note contains a part of the information presented in working detail in Circular 149 (E. S. R., 72, p. 158).

AGRICULTURAL METEOROLOGY

Progress in development of the U. S. Weather Service in line with the recommendations of the Science Advisory Board, W. R. GREGG (*Science*, 80 (1934), No. 2077, pp. 349-351).—This article, by the Chief of the Weather Bureau, states briefly what the Bureau has done and is planning to do, in line with recommendations of the Science Advisory Board (E. S. R., 70, p. 582), regarding especially "(1) an extension of the air-mass analysis method of forecasting; (2) consolidation of weather and communication service under the Weather Bureau." Other recommendations of the board, such as "decentralization of the general forecast service, special training of qualified personnel, improved exposures of instrumental equipment, an increase from two to four observations daily, and more detailed information in those observations", are also briefly considered.

Micro-climatology, L. A. RAMDAS (*Cur. Sci. [India]*, 2 (1934), No. 11, pp. 445-447).—Reference is made to previous investigations, by the author, of phenomena taking place in air layers near the ground (E. S. R., 72, p. 13) and to that of other investigators in this field. The aims of microclimatological studies are stated, and some of the important aspects of this new subject are briefly summarized, more particularly the role of solar radiation, since, as the author states, "most variations of atmospheric conditions may be traced ultimately to (1) variations in the intensity of solar radiation received at the earth's surface, and (2) variations in the disposal of the thermal energy derived by the earth's surface from solar radiation."

Humus ortstein and bleichsand as products of opposite kinds of climate [trans. title], W. BEIJERINCK (*K. Akad. Wetensch. Amsterdam Proc.*, 37 (1934), No. 2, pp. 93-99, fig. 1).—Evidence is presented from which the conclusion is drawn with a reasonable degree of certainty that bleichsand (bleached sand) and humus ortstein (hardpan) are products of opposite kinds of climate in the sense that the first is the product of moist, mild climatic conditions and the second is a residual product of Arctic climatic conditions.

Precipitation trends, J. B. KINCER (*Bul. Amer. Met. Soc.*, 15 (1934), No. 8-9, pp. 191-193).—This article briefly summarizes results of a comprehensive study of precipitation trends in each State east of the Rocky Mountains. This shows "a well-marked tendency during the past quarter of a century to descending trends in much of the North, especially the Northwest, and to rising trends in the South. In most cases in the South and East the curves have changed to downward in recent years."

The penetration of rainfall through hardwood and softwood forest canopy, H. W. BEALL (*Ecology*, 15 (1934), No. 4, pp. 412-415, fig. 1).—One season's records taken by the Petawawa Forest Experiment Station, Ontario, in coniferous and hardwood stands showed approximately 60 percent of the total rainfall reaching the forest floor in the former and 80 percent in the latter situation. In a pure stand of white pine with 96 percent canopy 57 percent of the total rainfall reached the soil. Where gages were placed within 1 ft. of the trunks the recovered moisture was much lower than that further out under the branches.

Influence of a forest on the temperature of the air [trans. title], P. SELTZER (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 6, pp. 435-438, figs. 3; *abs. in Sci. Abs., Sect. A—Phys.*, 37 (1934), No. 442, p. 972).—From observations in a forest of young oaks the conclusion is drawn that in general there is a cooling of the air in such forests, but especially near the surface of the soil, as a result of the sinking down of colder air.

Influence of weather conditions on the growth and yield of wheat, J. W. HOPKINS (*Canada Natl. Res. Council Ann. Rpt.*, 16 (1933), p. 28).—From an analysis of data for a period of years at seven experiment stations in Saskatchewan and Alberta on the yield of wheat as related to seasonal weather conditions, it is concluded that "above average rainfall in the early part of the growing season appears to result in increased yields. From 30 to 90 days after seeding, the beneficial effect, as measured by the increase in yield due to each additional inch of rain, shows a progressive diminution. Rain falling in the period 95 to 110 days after seeding seems to be definitely detrimental. Higher than average temperatures at the time of seeding and during the first month of the growing season are associated with increased yields. During the period 30 to 85 days after seeding, however, high temperatures appear to be unfavorable, the maximum detrimental effect being experienced approximately 60 days after seeding. Subsequent (85 to 110 days after seeding) above average temperatures are again beneficial."

Daily forecasting of wind velocity for tobacco growers [trans. title], C. KASSNER (*Ztschr. Angew. Met., Wetter*, 51 (1934), No. 9, pp. 306, 307).—Attention is briefly called to the importance of wind velocity in connection with control of ventilation in the curing of tobacco and to the system of the Meteorological Magnetic Observatory in Batavia, Java, of daily forecasting and reporting wind velocities to tobacco growers.

SOILS—FERTILIZERS

[Soil work of the Florida Station] (*Florida Sta. Rpt. 1933*, pp. 67, 68, 69-73, 165-169, 171, 172).—Data are reported on the determination of the effect of varying amounts and different carriers of potash on the composition and yield and quality of citrus fruits, effect of various fertilizer formulas on citrus, potatoes, and tomatoes, and studies of concentrated fertilizers for citrus, all by R. W. Ruprecht; determination of the effect of green manures on the composition of soil, by R. M. Barnette; and soil and soil fertility investigations in the Everglades, by R. V. Allison, J. R. Neller, A. Daane, F. D. Stevens, and R. E. Robertson.

[Soil work of the Hawaii Station] (*Hawaii Sta. Rpt. 1933*, pp. 4, 5).—"In continuation of work on the relation of colloid material and organic matter to soil moisture conditions and the wilting point of plants grown on the soil, detailed studies were made with 18 soils collected on the islands of Hawaii and Maui, [soils] which have been formed under widely varying conditions of rainfall and temperature." Ratios of moisture equivalent to wilting percentage on these soils are reported.

[Soil and fertilizer investigations of the Utah Station] (*Utah Sta. Bul. 250* (1934), pp. 21, 43, 44, 60).—Soil work noted in the report includes analysis of factors responsible for loss of nitrogen and organic matter from the dry lands, by A. F. Bracken and J. E. Greaves; factors influencing the bacterial activity of the soil, by Greaves; permanent fertility studies, by Greaves, C. T. Hirst, and K. R. Stevens; and technical studies of the physical and physico-

chemical properties and processes in soils, by D. S. Jennings, W. Gardner, and O. W. Israelsen.

Organic base exchange compounds in soils, W. T. McGEORGE (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 575-579).—Green manures and crop residues, including plant roots, showed themselves capable of increasing materially the base-exchange capacity of such soils as were examined by the author of this contribution from the Arizona Experiment Station, who further considers that an inorganic fraction of plant material also possesses the property of base exchange.

"Whether of the nature of isoelectric precipitates or synthetic zeolites, the bases adsorbed by the inorganic fraction of this exchange complex, as well as those adsorbed by the organic fraction, should be in an easily available form because of their noncrystalline structure."

Declining nitrate levels in Putnam silt loam, W. A. ALBRECHT (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 569-574, figs. 4).—The author describes a test of some years' duration made on a Putnam silt loam soil of the Missouri Experiment Station, drawing the general conclusion that "these data emphasize with significant force the lowering of the nitrate level with time and at rates varying with different crops. Further, they point out that this decline is little disturbed by common fertilizer applications and continues under fallow even in the face of relatively heavy applications of green manure. The data suggest that much nitrate production is going on at the expense of the virgin organic matter in the soil. Such changes in fertility levels reflect themselves in variable clover stands and in the crops following, suggesting that other fertility factors besides nitrogen may be following a similar decline and may be associated with the causes in operation."

Displacement of soil solubles through plant roots by means of air pressure as a method of studying soil fertility problems, C. W. LAURITZEN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 807-819, fig. 1).—The author of this contribution from the Michigan Experiment Station devised an apparatus by means of which stem stubs of plants growing in pots can be connected to delivery tubes passing through the end of an airtight pressure chamber, in which the pot is placed in a horizontal position for the experiment. The pressure chamber is provided with an inlet for compressed air, a pressure gage, a safety valve, and an outlet valve, and, in the form in which it is illustrated, with three delivery tubes. Of the nature and significance of the results obtained, it is noted in part that:

"The exact nature of the solution forced from the cut stem stubs of the plants by the application of air pressure is not known. There can be no doubt that it is not unaltered soil solution, nor can it be entirely root sap squeezed out by the pressure applied, inasmuch as the amount obtained in many cases is equivalent in weight to several times the weight of the green plant top cut from the root. To say that the solution obtained is soil solution which is altered as a result of being forced through the plant roots is probably as complete and accurate a statement as can be made.

"The solution is altered more by living than by dead roots, if it can be assumed that a dilute acid extract of the soil is an index of the soil solution. . . . The fact that the concentrations of phosphorus and potassium are much higher and that the concentration of calcium is much lower in the solutions obtained by means of living roots than the concentrations of these elements in the solutions obtained by means of dead roots would lead one to believe that the condition of the roots, as to whether or not they are alive, is in some

way responsible for the marked differences in concentration in the solutions obtained. Again, since the concentrations of these nutrient elements in the solutions obtained by means of dead roots approach much more closely the concentrations of these elements in the soil extract, it would appear that the living root under the conditions of this experiment retains, to some extent at least, the power of selective intake of nutrients which some believe to be an inherent property of the roots of growing plants. . . .

"The use of air pressure as a means of forcing solution from the soil through plant roots appears to offer a profitable means of investigating soil-plant nutritional problems, although the investigation using this method has not been sufficient to prove its value conclusively or to define its scope and limitations. Thus far the method has been applied only to plants grown in potted soil, but there appears to be no reason why it cannot be applied to plants grown in the field if the soil containing the roots is removed intact and placed in a pressure chamber. The method could be applied equally well to plants growing in sand or water cultures, and it appears that this procedure offers an opportunity for studying the effects of the various solubles common to nutrient media in regard to their individual and relative concentrations on the intake of the separate elements from solution."

Acidity, antacid buffering, and nutrient content of forest litter in relation to humus and soil, M. J. PLICE ([*New York*] *Cornell Sta. Mem.* 166 (1934), pp. 32, fig. 1).—Determinations of the content of lime and other principal bases, antacid buffering, acidity, and total nitrogen content in the fresh, mature, leaf, or needle litter of some northeast-American and a few other trees are reported in part 1 of this paper. Some other determinations, including silica content of tree litter and potash and phosphorus content of a few forest-ground plants, are reviewed briefly.

"Great differences according to species were found. The variation within a species may be considerable, but mostly it showed only an obscure relation to the presence or absence of carbonates in the soil. No consistent relation between base content, antacid buffering, and acidity of the litter was found, many species ranging very differently in these respects. A hyperbasic, a middle, and a superantacid series are distinguished. In the last two, particularly the last one, the antacid buffering is not nearly accounted for by the content of mineral bases."

In part 2 are reported studies made on the humus layer in chosen localities with different tree covers as to acidity, antacid buffering, lime content, depth, type, and nitrogen mobilization during storage. Parallel observations and determinations on horizons of the subjacent mineral soil are reported in many cases.

"A distinct influence of the tree cover and clear relations between properties of the litter and of the humus layer were found in several instances, these being clearest in the case of hemlock. The specific effect of the tree cover is easily offset, however, by variations in site, as was indicated by a study on a mapping basis made in the nearly virgin Heart's Content forest area in north-western Pennsylvania." Descriptions and chemical analyses of four type profiles (different shades of podzols) from the area mentioned are appended.

Moisture and pH studies of the soil under forest trees, G. M. SHEAR and W. D. STEWART (*Ecology*, 15 (1934), No. 2, pp. 145-153).—The investigation reported upon in this contribution from the Illinois Experiment Station was concerned with the pH value and moisture content of soil samples from depths down to 10 ft., taken at various times from November 1927 to May 1929 under five species of trees grown in pure stands on prairie soil.

In the cases of all species except white pine, water was found to be removed from the soil most rapidly at about the time new foliage is produced. Larch, white oak, and white pine removed more water from the first 4 ft. of soil during the growing season than green ash and silver maple. Soil samples to a depth of 10 ft. under white oak, 9 ft. under larch, 8 ft. under silver maple and white pine, and 7 ft. under green ash show that the moisture content of the soil to these depths is affected by the trees. The water table fluctuated from 3 to 4 ft. down to these depths. "The soil was more acid to a greater depth under white oak, with decreasing acidity under white pine, larch, green ash, and silver maple in the order named. Regardless of differences in the fluctuation of the water table, the soil reached a fairly constant pH at 6 ft. under all species."

Dangers of deterioration under continuous cropping, H. H. MANN ([*Rothamsted Expt. Sta., Harpenden*], *Rothamsted Confs., No. 17 (1934)*, pp. 30-34).—In presenting and discussing field plot data, recorded from 1877 to 1926, to show the steady decline in yields from continuously cropped land, the author admits that "at present the explanation evades us" but issues "a warning against the idea that by the use of artificial manures or any other means the falling off in value of continuously grown crops can be avoided. It is often . . . a great temptation to grow a valuable crop very frequently, if not continuously, and trust to heavy artificial manuring to maintain the fertility of the land. This policy is definitely dangerous, and, if long continued, all the evidence available would indicate that the land will deteriorate in value."

Reclamation of virgin black alkali soils, J. L. WURSTEN and W. L. POWERS (*Jour. Amer. Soc. Agron., 26 (1934), No. 9, pp. 752-762*).—Work on the restoration of hard virgin black alkali soil to a normal fertile state as determined by crop yields and soil analyses is reported in a contribution from the Oregon Experiment Station for the oldest alkali experiment field in the Northwest. "Sulfur, gypsum, and manure are used in various combinations and amounts as supplements to deep drainage and copious irrigation. Rye, sweetclover, and alfalfa are repeatedly seeded until a good stand of alfalfa is established."

Check plats treated in every case identically as were the treated plats with the exception of chemical treatments have not as yet shown much improvement, "which indicates that black alkali soils cannot be reclaimed by irrigation and drainage alone in any reasonable length of time." The check plats were found to contain about 4 times as much of alkali salts as did the treated plats. The reaction has been reduced to about pH 7.6 on some of the more favorably treated plats, but remains about pH 9.0 on the check plats. Base-exchange studies have shown that the clay complex in the treated plats contains mainly calcium and very little sodium, while on the check plats this relation is reversed. A good correlation between the crop yields secured and the proportion of calcium in the exchange complex of the soil was demonstrated.

Sulfur has proved to be the most effective and economical single chemical treatment if used in sufficient amounts. Sulfur and gypsum used in combination are more effective than either used alone. Manure alone is rather ineffective, but 500 to 1,500 lb. of sulfur per acre used in combination with manure is very effective. One thousand lb. of sulfur per acre used with manure would perhaps give the most economical returns per unit invested. Gypsum even when used in very large amounts has been less effective than sulfur. . . .

"The results obtained clearly indicate that reclamation of virgin black alkali soil is possible by the use of chemical treatments together with drainage and irrigation."

Effect of composting on the chemical and biological changes in peat and in wheat straw. A. J. BAUR (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 820-830).—This contribution from the [New York] Cornell Experiment Station reports upon a study of decomposition under the influence of various supplemental treatments of two muck soils, a peat, and composted straw.

"The well-decomposed Rose and Montezuma mucks were not greatly affected by any of the treatments. The use of lime alone caused no significant chemical or biological change. Superphosphate plus potassium chloride with and without lime decreased nitrates, but had no effect on the number of heterotrophic micro-organisms. Some of the composts received ammonium sulfate either alone or with a complete fertilizer. Nitrate accumulation was high in these cases, due mainly to the nitrification of part of the applied ammonium sulfate. The use of ammonium sulfate alone or with superphosphate, potassium chloride, and lime temporarily increased the number of bacteria but decreased the fungi. The manure inoculum had very little effect, but any differences noted were in favor of increased nitrates and micro-organisms. The control composts showed a rapid accumulation of nitrates, a low content of ammonia, and large numbers of bacteria and fungi.

"An application of lime to the poorly decomposed Cicero peat caused nitrate accumulation. This effect was not demonstrated consistently by any of the other treatments. Lime alone or with nitrogen, phosphorus, and potassium greatly increased the number of bacteria during the first part of the incubation period. All of the treatments except lime alone and manure increased the ammonia content and the number of fungi in these composts.

"The application of complete fertilizer with lime hastened the decomposition of straw by immediately increasing the number of micro-organisms. Nitrates accumulated in these composts."

Potassium chloride depressed the accumulation of nitrates in the Rose and Montezuma mucks, and proved to be toxic to the development of autotrophic organisms. This effect was not observed when either potassium sulfate or dipotassium acid phosphate were used.

Relative numbers of three species of *Rhizobium* in Dunkirk silty clay soil. J. K. WILSON (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 745-748).—This contribution from the [New York] Cornell Experiment Station presents evidence indicating that neither the acidity nor the alkalinity of the soil have anything to do with the capacity of soils to maintain various species of the root nodule bacteria. "No significance can be attached to the moisture content of the soil, to the season of the year when the samples were taken, or to the crop on the soil as bearing any relation to the findings. No direct data are available to explain why soils vary in their capacity to support the various species of the root nodule bacteria. It might be pointed out that this numerical relationship coincides very closely with the hardness of these three species when they are grown on an artificial medium in the laboratory, and also with the hardness of the three host plants when they are grown in the field."

The fertility requirements of Bedford silt loam. G. P. WALKER (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 767-772, figs. 5).—Data contained in this contribution from the Indiana Experiment Station indicate lime as the first requirement of the soil in question, followed by phosphates and nitrogenous fertilizers. Potassium compounds had little effect, and manuring gave but small increases when used for crops other than corn.

"A system of returning the manure produced, supplemented by 700 lb. of commercial fertilizer in the 4-yr. rotation on limed land, has maintained yield levels of 31 bu. of corn, 9.5 bu. of soybeans, 14 bu. of wheat, and about a ton

of clover hay per acre above the production levels of untreated Bedford silt loam over a 16-yr. period."

Soil, field-crop, and pasture management for Herkimer County, New York, I, III ([*New York*] *Cornell Sta. Bul.* 612 (1934), pp. 3-34, 78-83, figs. 16, map 1).—Parts 1 and 3 of this bulletin, here dealt with, cover the pedological phases of the subject. Part 2 is noted on p. 318.

I. Soil and field-crop management, A. F. Gustafson.—This part takes up, among other topics, the climate, topography, drainage, and soils of Herkimer County; soil areas and their composition; the comparative use of the land; the lime needs and crop adaptations of Herkimer County soils; production and use of farm manure; the use of fertilizers in Herkimer County; fertilizer experiments; and rotation of crops, including cropping plans, fertilization, and rotations for the different types of soils.

III. Soil map and soil-type descriptions, F. B. Howe and A. F. Gustafson.—This part contains concise descriptions of the 27 soil series found in Herkimer County and of the 40 types and 4 phases included in them, together with a soil map of the county.

The use of rapid chemical tests on soils and plants as aids in determining fertilizer needs, S. F. THORNTON, S. D. CONNER, and R. R. FRASER (*Indiana Sta. Circ.* 204 (1934), pp. 16, pls. 3, figs. 6).—Rapid chemical tests on soils and plants are considered to offer a practical and inexpensive method for determining soil reaction and available plant food supply. The system of testing described makes use of practically identical reagents, equipment, and technic for both soil and plant tests, indicating, in soils, the reaction, the dilute acid-soluble phosphorus, and the water-soluble and replaceable potassium, and, in plant tissues, the relative importance of nitrate, phosphate, and potassium in relation to other possible limiting factors.

"Such tests supply valuable information regarding plant food supplies from which it is possible to make recommendations for the proper use of fertilizers. As a basis for a definite fertilizer recommendation, the test results should be coupled with the general experience as to amount of fertilizer and time and method of application which has been found profitable. Since the productiveness of a soil is not solely a matter of a certain number of pounds of plant food per acre, full consideration should be given to other possible limiting factors."

A comparison of the Neubauer, plant-sap analysis, and Hoffer stalk-test methods for determining the nutrient supply of soils, N. A. PETTINGER and S. F. THORNTON (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 547-561, figs. 2).—The authors compare with the Neubauer (*E. S. R.*, 53, p. 319) and Hoffer (*E. S. R.*, 56, p. 220) methods of determining the nutrient requirements of soils a sap analysis test (*E. S. R.*, 66, p. 19) which has also been used for the same purpose, in a contribution from the Indiana and Virginia Experiment Stations. The Hoffer method results correlated with those of the Neubauer method rather better than did those of the sap test with respect to potassium availability.

"The average nitrate values obtained by the stalk-test and sap-analysis methods were correlated to the extent of $+0.77 \pm 0.076$. Under the conditions of the experiment this is considered to be good agreement. Because of the presence of clover in the rotation, the nitrate estimates by these two methods show only a fair degree of correlation with the application of commercial nitrogenous materials. The average available phosphorus estimates obtained by the Neubauer and sap-analysis methods were correlated to the extent of $+0.92 \pm 0.028$, and therefore show nearly perfect agreement. The values obtained by these two methods were also in excellent agreement with phosphatic

fertilization and in estimating the effectiveness of the different phosphorus carriers used. The average available potassium estimates by the Neubauer, sap-analysis, and stalk-test methods were all strongly correlated, and therefore in excellent agreement. The following correlation coefficients were obtained: Between average Neubauer and sap-analysis values, $+0.92 \pm 0.027$; between average Neubauer and stalk-test values, $+0.96 \pm 0.014$; between average sap-analysis and stalk-test values, $+0.96 \pm 0.013$."

Fertilizer analyses for different North Carolina crops, including the best percentages of water-insoluble nitrogen of totals in fertilizer mixtures recommended (*North Carolina Sta. Agron. Inform. Circ.* [88] (1934), pp. 14).—Fertilizer recommendations are made for the various soil provinces of the State. In a final table are given "the recommendations of the department of agronomy with reference to the most suitable water-insoluble nitrogen content of fertilizer mixtures for different crops grown on different classes of soils in average condition of the three main soil provinces of the State."

Suitable fertilizer mixtures for different crops, including the functions of chief plant nutrients, H. B. MANN and W. H. RANKIN (*North Carolina Sta. Agron. Inform. Circ.* 89 (1934), pp. 13).—Practically the same information is given in this as in the circular above noted, except that the recommendations are grouped under primary heads of the various crops, with secondary reference to soil provinces.

Interpreting fertilizer analyses with reference to the sources of nitrogen, A. W. BLAIR (*New Jersey Stas. Circ.* 331 (1934), pp. 4).—This circular presents a brief popular discussion of the effect of fertilizers containing their nitrogen in the form of ammonium salts or of ammonia-yielding compounds in increasing the acidity of the soil.

"The fact that acidity is developed when ammonium salts are used need not be construed as condemning the use of these materials, but rather as condemning the practice of using them without keeping a careful check on the lime requirement of the soil."

Potash occurring in irrigation water in relation to plant fertilization, F. E. HANCE, Q. H. YUEN, E. K. HAMAMURA, T. NISHIMURA, and P. E. CHU (*Hawaii. Planters' Rec.*, 38 (1934), No. 3, pp. 234-252).—Irrigation waters tested were found to contain potassium in varying quantities; and inasmuch as the potash removed by the sugarcane crops of two fields examined was in excess of that supplied by fertilizers and that lost by the soil, it is considered that "the potash occurring in irrigation water functions in plant nutrition."

The efficiency of certain ammoniated superphosphates and other phosphate fertilizers, F. B. SMITH, P. E. BROWN, H. T. MILLER, and C. C. MENSING (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 591-599).—The various phosphates subjected to comparative trial in the experiments reported upon in this contribution from the Iowa Experiment Station included three superphosphates; six ammoniated superphosphates; mono-, di-, and tricalcium phosphates; a mixture of tricalcium phosphate with monoammonium phosphate in the proportion, 4:1; slags; steamed bone meal; a calcined phosphate; natural iron and aluminum phosphate; bone ash; and phosphated rock samples of various origins.

"In general, a close correlation was found between the crop response to these fertilizers and the amount of available phosphorus in the variously treated soils as determined by all the laboratory methods except the Bray test [E. S. R., 62, p. 13]. It was also noted that the superphosphates were more efficient than the natural rock phosphates in increasing the crop, and the soils treated with superphosphates were higher in content of available phosphorus than the

soils treated with rock phosphate by all methods except by the Truog test [E. S. R., 64, p. 312]. However, no one test showed the efficiency of all fertilizers accurately under all conditions."

Phosphate fixation in Hawaiian soils, III, L. E. DAVIS (*Hawaii. Planters' Rec.*, 38 (1934), No. 3, pp. 206-215).—Continuing a discussion initiated by Hance and extended by Ayres (E. S. R., 71, p. 754), the author considers, with a partial presentation of his experimental results, the three possible mechanisms of soil phosphate fixation—(1) precipitation by cations dissolved from the soil mass and reacting with the soluble phosphates added as fertilizer, (2) soil colloid adsorption, and (3) solid phase absorption to form solid solutions. Precipitation and adsorption having been shown to account for only a minor proportion of the observed fixation, "the single alternative explanation for phosphate fixation" is that phosphates are absorbed by the soil material, actually penetrating the solid phase to react and form new compounds in solid solution.

"It is shown that while most of the absorbed phosphate is not immediately available, an equilibrium concentration of available phosphate is maintained in the soil solution. Due to the slow rate of fixation, some available phosphate remains for some time after fertilization. Fixation is not entirely harmful. It conserves the phosphate supply. In some cases it may be feasible to build up a phosphate reserve by an initial heavy fertilization, followed by lighter applications. In other cases this may not be practicable, and phosphates should probably be supplied in briquettes or in insoluble forms."

Studies in the absorption of calcium from nutrient solutions, with special reference to the presence or absence of boron, K. WARINGTON (*Ann. Bot. [London]*, 48 (1934), No. 191, pp. 743-776, figs. 8).—In part, the results of the investigation reported upon in this contribution from the Rothamsted Experimental Station indicated that in a 9-week growth period *Vicia faba* seedlings absorbed calcium in increasing quantities up to the fourth week in the absence of boron, and up to the seventh week in the presence of traces of boron. "Less calcium was absorbed from solutions renewed at weekly or fortnightly intervals than from unrenewed solutions when boron was present, but the reverse was the case if boron were not provided. This difference is attributed to the fact that renewal of the solution delays the appearance of the boron deficiency symptoms, and thus prolongs the absorbing capacity of the plant. The quantity of calcium absorbed was approximately proportional to the calcium supplied, irrespective of the presence or absence of boron, although the total calcium taken up was much reduced under the latter condition.

"No correlation was found between the calcium supplied and the nitrogen or potash content of the plant, both the latter showing a closer affinity with the production of dry matter. Under full nutrient conditions the N/Ca and K/Ca ratios in the plant fell as its age increased, the fall being more marked in the presence than in the absence of boron. A lack of boron, therefore, reduced the uptake of calcium more than that of nitrogen or potash.

"In the presence of boron, the calcium absorbed per unit dry matter produced was higher from a pure solution of calcium chloride than from a complete nutrient medium containing a similar quantity of calcium. In the absence of boron, death ensued the more rapidly in the plants grown in the single salt solution, so that the presence of other nutrients apparently increased the requirement of the plant for both calcium and boron. Although the evidence is not conclusive, indications of an association between boron and calcium were, therefore, obtained."

A magnesium deficiency induced by previous fertilizer treatments, H. C. KNOBLAUCH and T. E. ODLAND (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 609-615).—The investigations recorded in this contribution from the Rhode Island Experiment Station include both field and greenhouse experiments in which a chlorosis and poor growth of potatoes on certain of the station's experimental plats, suggestive of a deficiency in some essential element, were traced to an insufficient supply of magnesium in the soil.

"It was found that magnesium was the deficient element and that a high potash supply in the soil under acid conditions facilitates a magnesium deficiency. Probably the cause of the magnesium deficiency is that the fertilizers applied have been relatively free from magnesium and that there has been a continual loss of this element by crop removal and leaching. Further, it is probable that the high concentration of potassium has largely displaced the available magnesium of the soil and that the excess concentration of potassium has interfered with magnesium absorption."

"With a fertilizer high in potash and on an acid soil, the yield was much reduced from that obtained with the standard fertilization. When magnesium sulfate was applied to the high-potash soil in 1931 and 1932, a significant increase in yield was obtained. However, supplementing the normal fertilization with magnesium sulfate gave a much larger relative increase. In 1933, a significant response was also obtained from the magnesium sulfate, but the depression in yield observed the two previous years with the high-potash soil did not occur. When lime is used, the best yields of potatoes are usually obtained on those plats with a relatively high-potash fertilizer. In experiments where different magnesium sources were used, all were found effective when supplying a minimum of 20 lb. of MgO per acre. Larger quantities than this did not give further increases in yield. The greenhouse tests with a high-potash soil showed a significant response to magnesium sulfate. While supplying magnesium was beneficial, it did not give as large an increase with the high-potash fertilizer as was obtained from the low-potash and magnesium treatment."

AGRICULTURAL BOTANY

Cell size and structure in plants as affected by various inorganic elements, B. F. LUTMAN (*Vermont Sta. Bul.* 383 (1934), pp. 54, figs. 22).—Following a review of literature dealing with this subject and a digest of available information on the particular effects of N, P, K, Ca, and Mg in plants and of the effects of deficiencies in these elements, the author presents the results of studies of Japanese millet, potato, buckwheat, rape, and garden beets extending over 2 or 3 yr.

The plants were grown under comparable conditions in glass sand with nutrient solutions lacking some one of the elements mentioned, and in some cases containing an excess of one of them. The comparative effects are described and illustrated by photographs and drawings. A list of over 150 references is appended.

Marked differences were observed in the responses of the different kinds of plants to the different nutritional situations created. The plants, however, according to the author, were probably able to secure some of the lacking elements from the seed, some from impurities in the chemicals used, and possibly some from the walls of the container. The types of tissue compared were the root tips, epidermis, leaf palisade and pulp parenchyma, and stem cells. It was found that lack or excess of a given inorganic nutrient revealed itself soon, even in the very young organs.

The root tip cells showed lack of most of the studied elements by a premature vacuolization, indicative of maturity and senescence. An excess of any given element did not affect root tip cells materially, except that in the excess-N plants these cells contained very large nuclei and very dense cytoplasm.

Selecting for study leaves of approximately similar areas, the author found that epidermal and guard cells from plants grown in solutions lacking one element sometimes manifested marked differences and sometimes but slight ones. In Japanese millet the epidermal cells and nuclei of no-N plants were smaller, but no material differences were seen in the size of the guard cells or stomata. In rape the no-K plants had smaller epidermal and guard cells, the excess-K plants larger ones, while with the other solutions differences were not marked. In buckwheat no-N epidermal and guard cells were smaller, the no-P and no-K cells somewhat smaller, while the guard cells were very small, and the epidermal walls were very difficult to distinguish when Ca was missing. In beet the epidermal and guard cells of the first leaf of no-N plants resembled those of the second leaves of complete-solution and excess-N plants, but were very small. Those from no-P and no-Ca plants were also small. On the other hand, with excess N, P, K, or Ca the cells from the first leaves were found to be larger than with the other treatments, whereas the differences were less marked in the second leaves.

The size of the cells within the leaf was reflected in the size of the plant. It was found that early maturity and senescence in these cells may result from lack of an element, while excess of it may delay maturity and senescence. In potato long, slender cells with few chloroplasts were produced in the absence of N, and large, intercellular spaces occurred in the leaves. Excess N produced small, closely appressed palisade and pulp parenchyma cells, and the intercellular spaces were small and fewer. A lack of P or Mg exerted less influence on cell structure and contents. In millet fewer and smaller chloroplasts were formed with lack of N, whereas they were large and numerous with excess N. When Mg was lacking fewer chloroplasts per cell were formed. A lack of P exerted little effect. In rape, the size of the palisade cells was somewhat in accord with leaf size. This observation also held true for buckwheat, especially for the no-N and no-K plants. The smaller the cells, the smaller were the nuclei and chloroplasts, and vice versa.

Correlation between any given plant and the size and number of its vessels and bast fibers is marked. This was true in the stems of rape. Furthermore, in this plant the cortical cells of the stems of the no-Ca lot seemed larger than those of plants treated otherwise. In buckwheat stems the same holds true for the vascular bundles, but the cortical and pith parenchyma cells of plants grown on complete and no-Mg solutions were much larger than in any other cases. The cells in the no-N plants were particularly small, and those in the no-K and no-Ca plants were almost as small.

The better nourished plants (those grown with excess N, the complete, and the no-Mg solutions) had thicker cuticles than the others, except for the epidermal cuticles of rape or buckwheat, which seemed little influenced.

Factors affecting the development of the cotyledonary buds of the common bean, *Phaseolus vulgaris*, C. F. MORELAND ([*New York*] *Cornell Sta. Mem.* 167 (1934), pp. 28, pls. 2, figs. 11).—Most of the earlier investigators working with this species have concluded that the normal inhibition of the growth of the cotyledonary buds is due to the production and transfer of an inhibitory substance (hormone), or the transmission of an inhibitory influence from the apical growing points, and not to a food or water relation within the plant. The author conducted a variety of experiments to gain further informa-

tion as to the nature of the inhibition, and obtained rather definite evidence indicating that the growing, expanding leaves of the growing apex somehow draw to themselves the supply of nutriment and thus prevent these axillary buds from growing.

In these tests plants were grown 4 or 5 in a pot for about 3 weeks before treatment. Some were then decapitated at various heights. In others various leaves were removed. It was found that growing, expanding leaves had a more pronounced inhibiting effect than the apical bud had on the development of the cotyledonary buds. In other plants the phloem continuity between these axillary buds and the terminal growing regions was interrupted by ringing, V-notching, scalding, or splitting and severing one-half of the stem. The cotyledonary buds developed to a greater or less extent after all of these treatments.

The failure of the cotyledonary buds to continue growth after their growth was initiated by ringing the internode above them appears to be explained by the discovery that new phloem elements were regenerated in the ringed region, within 4 days after ringing, through meristematic activity of protoxylem parenchyma.

When the carbohydrate or nitrogen content in the plant was altered and the effect on bud development noted following decapitation, it was found that if either carbohydrates or nitrogen were too low bud development was not initiated.

By suitable treatments the cotyledonary buds could be made to develop while the growing apex was still intact. By other treatments the buds were caused to remain dormant even though the growing apex had been removed. Submergence in warm water or in 3-percent thiourea failed to initiate the growth of the cotyledonary buds.

The author does not consider that the data obtained prove conclusively that growth-inhibiting substances do not exist in the normal bean plant which prevent the growth of the basal buds, since the treatments devised to alter the nutrient supply to the buds may also have altered the supply of an inhibiting substance. He does, however, hold that the data offer evidence indicating that these buds normally fail to develop because of a deficiency of some material, apparently nitrogen, which the growing top takes away from them, rather than because they receive any substance from above that prevents their development.

The influence of ultraviolet radiation on the germination and first vegetative period of certain seeds [trans. title], F. REICHERT and E. F. PAULSEN (*Rev. Facult. Agron. y Vet. Buenos Aires*, 7 (1934), No. 3, pp. 501-506, figs. 2).—Dry seeds of maize, wheat, alfalfa, lupine, vetch, flax, beets, cabbage, radish, lettuce, tomato, etc., were exposed from 5 to 60 min. to the rays of a mercury vapor (original "Hanau") lamp with a Uviol filter passing ultraviolet light. They were then germinated in covered dishes on filter paper. In general, the effect on vigor proved favorable with summer growing types, but unfavorable or absent in the case of winter types. Maize, especially, was very favorably influenced in every one of about 30 tests in which different varieties were used and subjected to different conditions. The effect on wheat, however, was always unfavorable.

Water and cane ripening, C. E. HARTT (*Hawaii. Planters' Rec.*, 38 (1934), No. 3, pp. 193-206, figs. 2).—This contribution from the Hawaiian Sugar Planters' Association Experiment Station describes preliminary experiments in which potted sugarcane plants, some in moist soil and others in soil so dry as to stop elongation, were exposed to light for 7 hr. and analyses made to determine the effect of the soil moisture differences upon photosynthesis and carbohydrate

accumulation. While greater synthesis of sucrose was found in the blades of plants supplied with water, the author considers that final conclusions should not be drawn from the data presented until the experiment is repeated.

GENETICS

A bibliographical monograph on plant genetics (genic analysis), 1900-1929, H. MATSUURA (*Sapporo: Hokkaido Imp. Univ.*, 1933, 2 ed., rev. and enl., pp. XX+787).—This monograph embraces a comprehensive review of genic analyses of plants compiled alphabetically in order of specific names; a list of 2,077 titles, each briefly annotated, arranged chronologically; and indexes of subjects, species, families, and authors, indicating the genera investigated by each author. Forewords by E. B. Babcock and K. Fujii are included.

Linkage of a quantitative and a qualitative character in barley, H. WEXELSEN (*Hereditas*, 17 (1933), No. 3, pp. 323-341, figs. 2).—In a cross between Machine with rough awns and rachis internodes averaging 3.5 mm long and Smooth Awn (C. I. 4252) averaging 4.05 mm, rough awn behaved as a simple dominant, whereas differences in internode length seemed due to two independent factors with about equal effect, their effect in a heterozygous condition being about half that in homozygous. One factor was linked to the factor for rough awning with about 10 percent crossing-over. The presence of a third factor was indicated.

Quantitative inheritance and linkage in barley, H. WEXELSEN (*Hereditas*, 18 (1934), No. 3, pp. 307-348, figs. 3).—Further studies involving the Machine, Smooth Awn, Asplund, Sacramento, and Abed Binder varieties dealt with the genetics of the internode length of the barley spike and its linkage relations with qualitative characters. Single factor differences were observed between long v. short rachilla hair (*Ll*), rough v. smooth awns (*Rr*), teeth on dorsal nerves of the lemma (*Gg*) and 2-row v. 6-row (*Zz*). *R* was linked with *L* and *Z* with *G*, with about 30 and 12 percent crossing-over, respectively.

As to the inheritance of length of internode of the spike, segregations of one, two, and probably up to five factors were noted. The factors *L*₁, *L*₂, *L*₃, *L*₄, *L*₅, and *L*₆ differ in effects on internode length when heterozygous. *L*₅ and *L*₆ in the homozygous recessive condition produce shorter lower internodes, resulting in pyramidal spike shape. *L*₂ was linked to *R*, with about 10 percent crossing-over, probably being situated between *L* and *R*. Linkage of *L*₄ to *Z* (40 percent crossing-over) and *G* placed it in the same linkage group I. The date of heading of the *F*₂ families was correlated with *G* and *Z*, showing that a factor for earliness also is situated in group I. Correlation found between date of heading of *F*₂ families and *L* and *R* demonstrated the presence of a factor for earliness in linkage group II.

Linkage data on the R-g₁ chromosome of maize, J. B. WENTZ and S. N. SMITH (*Iowa State Col. Jour. Sci.*, 8 (1934), No. 2, pp. 295-301).—Linkage data presented on five genes (*gm*₂, *pg*₁, *l*₂, *l*₄, and *g*₁) previously found located on the *R*-*g*₁ chromosome generally substantiate the relative positions of the genes on the chromosome as summarized by R. A. Emerson and associates in 1930, except for a currently unexplained absence of linkage between *gm*₂ and either *l*₂ or *l*₄.

The genetics of cotton, IX-XI (*Jour. Genet.*, 28 (1933), No. 2, pp. 315-325, pl. 1; 28 (1934), No. 3, pp. 437-513, figs. 20; 29 (1934), No. 2, pp. 181-195).—The series (E. S. R., 69, p. 783) is continued.

IX. Further experiments on the inheritance of the crinkled dwarf mutant of *G. barbadense* L. in interspecific crosses and their bearing on the Fisher

theory of dominance, S. C. Harland.—In a further study (E. S. R., 67, p. 227), observations were made on characters of crinkled when transferred by repeated backcrossing to *Gossypium hirsutum*. Selfing of the heterozygotes of the fourth and also the sixth backcross plants produced normal, intermediate crinkled, and extreme crinkled in a 1:2:1 ratio. Transfer of crinkled to other types of *G. hirsutum*, Triumph and Virescent Yellow, revealed complete or nearly complete dominance of *G. hirsutum* to the crinkled type. Discussion of the bearing of the experiments on Fisher's theory of dominance suggests that its modification is necessary. It is concluded that modifiers of dominance are of advantage to the wild type and are thus selected on their own account.

X. *The inheritance of leaf shape in Asiatic Gossypiums*, J. B. Hutchinson.—Studies of crosses between representative types of *G. arboreum* and *G. herbaceum* and their more important varieties, the multiple allelomorph series and mutable genes, the leaf shape of the hybrids of *G. stocksii*, the mutation rate, lint characters and leaf shape, and linkage relations are reported.

The main differences in leaf shape in Asiatic cottons result from the action of a multiple allelomorph series of five, of which L^B and l give dominant and recessive broad, respectively, L^I dominant intermediate broad, L^L lacinated, and L narrow leaf. L^L , L , and l give intermediate heterozygotes. L^B and L^I are dominant over all other members of the series. L^L , L , and l occur in nature in *G. arboreum* and its varieties. L^B and L^I arose by mutation in cultures of a lacinated *G. arboreum* strain. All *G. herbaceum* varieties so far reported carry l . The differences in leaf shape of taxonomic value are differences in minor genes affecting such characters as lobe shape, leaf size, and rumpling, and not laciniation.

The leaf shape multiple allelomorph series is linked with K for brown lint, with about 30 percent crossing-over. The Burma Lacinated strain is mutable at the L locus and at the K locus. L^L mutated to L^B , L^I , and l . Mutation occurred in about 1 per 1,000 of L^L gametes, in about 1 percent of homozygous L^L plants, and in 1 in 450 plants of Burma Lacinated \times 1304 F₁. K mutated to k in about 1 in 500 gametes. L^I mutated to L^B , and L^B mutated to l . *G. cernuum* is mutable in the L gene. Mutation was observed from L to l , and probably occurred from L^L to L . No dominant mutants were obtained from *G. cernuum*. Mutation occurred from L to l in two *G. arboreum* types, Cawnpore White and A13, in heterozygotes with Mutant Broad. No mutation was discovered in recessive broad. Mosaics and chimeras of two different leaf shape genotypes were observed in several crosses. The mosaics were very unstable and changed rapidly by further mutation to homogeneous mutant types.

F₁ hybrids of *G. stocksii* by four of the five leaf shape allelomorphs had leaf indexes of the same order as in cultivated Asiatic types.

Linkage existed between the leaf shape allelomorph series and genes affecting lint length, seed weight, and lint percentage.

The L series and the corolla color (Y) series assorted freely. There appeared to be linkage between the L series and the anthocyanin (R) series in a single cross. In other crosses the two allelomorph series assorted freely.

XI. *Further experiments on the inheritance of chlorophyll deficiency in New World cottons*, S. C. Harland.—Further experiments dealt with the mode of inheritance and distribution in six species of New World cottons of a pair of duplicate factors (C^{ha} , C^{hb}) for chlorophyll deficiency (E. S. R., 67, p. 227). Results could be explained without assumption of a third factor (C^{hc}). Duplication of factors was considered to have occurred through polyploidy, with subsequent mutation of one or other of the members constituting the pair in some of the species. *G. barbadense* and *G. darwini* became monomeric through

the loss of C^{hb} , while *G. purpurascens*, *G. hirsutum*, and *G. taitense*, when monomeric, lost C^{ha} . The data supported Haldane's view that in polyploid species one member of a pair of duplicate genes may mutate without disadvantage, provided its functions can be performed by a gene in one of the other sets of chromosomes. The taxonomic and evolutionary significance of the results is discussed.

Irregular sporogenesis and polyembryony in some Leguminosae, J. N. MARTIN and J. R. WATT (*Iowa State Col. Jour. Sci.*, 8 (1934), No. 2, pp. 303-307, figs. 9).—Two types of pollen in *Melilotus alba* and the tendency of *Trifolium pratense*, *T. repens*, *M. alba*, *Medicago sativa*, and *Vicia americana* to produce multiple mother cells and embryo sacs are discussed. Polyembryony in *M. sativa* and *Melilotus alba* is described, with consideration of the probable relation of the irregularities in the reproductive processes to seed production in these legumes.

A single factor mutation in *Melilotus alba* Desc. having multiple effects on homologous structures, L. E. KIRK and J. M. ARMSTRONG (*Canad. Jour. Res.*, 10 (1934), No. 6, pp. 787-792, pl. 1, figs. 2).—In the cutleaf mutant noted in *M. alba* a single factor recessive to normal affects shape of leaflets and petals, position of staminal column, morphology of the pistil, female fertility, and growth vigor. Sterility of cutleaf plants is attributed to defective pistils and not to lack of viable pollen. The mutant was normal ($2n=16$) in chromosome number and behavior at meiosis.

Metaxenia in the apple and squash, A. D. HIBBARD (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 140-142).—Observations at the Missouri Experiment Station on Ingram apples produced by blossoms cross-pollinated with Ben Davis or Wealthy showed the Ingram \times Ben Davis fruits to be significantly heavier than the Ingram \times Wealthy group. The difference in seed count, although in the same direction, was not significant. In a second trial, where Ben Davis and Wealthy pollens were applied to Golden Delicious fruits the average weights of the resulting fruits were practically equal.

Application of pollen of Big Tom and White Bush Scallop squashes to White Bush Scallop flowers and of White Bush Scallop and Big Tom pollens to Acorn flowers failed to show any significant metaxenial effects in shape, weight, quality, or color of the flesh.

The origin of the Pomoideae, K. SAX (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 147-150).—An examination of the meiotic divisions in several genera of Pomoideae failed to reveal any evidence of multivalent chromosome association in diploid forms, but there were indications of secondary pairing varying with the genera. Although there is good evidence, such as sterility in certain forms, supporting the polyploid origin of Pomoideae, the author believes it rather probable that the Pomoideae subfamily of Rosaceae is of allopolyploid origin and was produced by hybridization between different primitive forms followed by chromosome doubling. From a possible cross between 8- and 9-chromosome forms the author suggests that there might have been produced an entirely new type, with chromosomes sufficiently homologous to permit hybridization between two species or genera, but not similar enough to insure pairing and the production of fertile gametes.

Breeding and improvement of farm animals, V. A. RICE (*New York and London: McGraw-Hill Book Co.*, 1934, 2. ed., pp. XIII+516, figs. 141).—This is a textbook on animal breeding, based on newer knowledge and developments in animal genetics. An appendix is presented which gives a discussion of the present understanding of the inheritance of various characters in domestic animals.

Possible cytoplasmic as well as chromosomal control of sex in haploid males, W. E. CASTLE (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 2, pp. 101, 102).—In discussing the relationship of chromosome complexes to sex determination, the author concludes that haploid males are only somatically male but that they transmit potentially female determinative chromosomes. The theory of balance in sex determination will account for this condition, especially in these and similar cases, if it is assumed that the cytoplasm as well as chromosomes may influence somatic sex determination.

The inheritance and linkage relations of a new recessive spotting in the house mouse, F. H. CLARK (*Genetics*, 19 (1934), No. 5, pp. 365–393, figs. 3).—The hereditary behavior of a mutant character designated as bellyspot in the house mouse is described in several types of matings. The character consists of a small white spot about the size of a dime on the belly which is recessive and independent in inheritance of piebald and dominant spotting. It was found to be very closely linked with the flexed-tail-anemia complex previously noted by Hunt and Permar (*E. S. R.*, 62, p. 215).

Prenatal mortality of anemics was practically the same as normals, but 21.56 percent of the anemics died between birth and from 20 to 30 days of age as compared with 9.85 percent of normals.

There was no linkage found between bellyspot and piebald, dominant spotting, sex, pink-eye, Roberts' pink-eye, agouti, dilution, chocolate, naked, rodless, waltzing, brachyury, leaden, dwarf, or Zavadskaia shaker characters.

Linkage studies of brachyury (short tail) in the house mouse, F. H. CLARK (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 5, pp. 276–279).—Data are reported on the results of tests of linkage of brachyury (short tail) in the house mouse, with 14 other mutations. The mutations tested were flexed-tail, albinism, chocolate, leaden, dilution, Roberts' pink-eye, naked, rodless, waltzing, Zavadskaia shaker, hairless, dominant spotting, dwarf, and hydrocephalus. All of these showed only insignificant departures from the random segregation expected for independent characters.

A test of the possible effects of visual stimuli upon the hair color of mammals, F. B. SUMNER (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 6, pp. 397–402).—Negative results were obtained in a 7-week test of the influence of black-, white-, and yellow-colored surroundings on the pigment in newly developing hairs of young mice which had been depilated in spots.

Hairless mice and ultra-violet light, J. DAVIS (*Amer. Nat.*, 68 (1934), No. 718, pp. 478–480).—Hairless mice exposed to X-rays for six generations were able to withstand X-ray exposure somewhat better than controls whose ancestors had not been subjected to periodic X-ray treatment. It is suggested that the differences may have been due to the inheritance of acquired resistance, inadvertent selection for resistance to irradiation in the line, or purely a random difference expressed in the offspring.

Blood-group incompatibility in rabbit embryos and in man, C. E. KEELER and W. E. CASTLE (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 5, pp. 273–276).—The results of two experiments with rabbits are cited in which females of the O blood group, after receiving repeated injections of blood containing H₁H₂ agglutinogens, were mated with bucks heterozygous or homozygous for a single agglutinin. Several normal young were produced, from which it is concluded that the embryo may receive through the placenta, without harm, an agglutinin from the blood of its mother antagonistic to an agglutinin which the embryo possesses through inheritance from the father because of the continuous neutralization of the incompatible agglutinin in the circulation of the fetus.

The influence of pregnancy upon the titre of immune (blood-group) antibodies in the rabbit, C. E. KEELER and W. E. CASTLE (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 8, pp. 465-470, figs. 2).—It was found that female rabbits showed material decrease in the agglutinins present in the blood during the second and third weeks of pregnancy. This was followed by a sharp increase in the titer of the antibodies, especially evident during the first few days after parturition. This condition was observed in females bred to males carrying the agglutinins, as well as in mating with 0 bucks, proving that the lowering of the titer is a phenomenon of pregnancy and is independent of the genetic constitution of the embryos.

Physiology of reproduction in the rabbit: Age of sexual maturity, breeding season, duration of normal pregnancy, and ovulation, M. MANRESA (*Philippine Jour. Sci.*, 51 (1933), No. 3, pp. 323-330).—In a study of the normal breeding and reproduction in rabbits, it was found that the age at first coitus varied from 83 to 308 days in 126 does tested. The first fertile mating varied from 113 to 308 days. The normal gestation period was from 30 to 33 days in the rabbit in Wisconsin. The most favorable season for breeding was from March to July, and the least favorable was from July to September. There was a correlation of -0.2645 ± 0.0422 between the size of the litter and the duration of pregnancy. Spontaneous ovulation did not occur after parturition in the rabbit.

Effects of follicle-stimulating and luteinizing pituitary extracts on the ovaries of the infantile and juvenile rabbit, R. HERTZ and F. L. HISAW (*Amer. Jour. Physiol.*, 108 (1934), No. 1, pp. 1-13, figs. 7).—In studying the relative response of infantile rabbits to purified follicular-stimulating and unfractionated pituitary extracts, it was found that the ovaries of 4-week-old rabbits were unmodified, although the doses were sufficient to elicit a maximal response in juvenile animals. With continuous treatments with these products, the ovaries, which enlarged fivefold in juvenile animals, decreased to their normal dimensions at 15 days. Nearly half the juvenile rabbits tested showed response to treatment with luteinizing powder following a moderate treatment with follicular-stimulating hormone. There was much variation in this group. It is pointed out that the histology of the ovary of the infantile rabbit shows it to be much less developed than the ovary of the juvenile animal.

The effect of anterior lobe extract or concentrated human urine of pregnancy upon the early part of gestation in the rabbit, G. B. WISLOCKI and L. GOODMAN (*Anat. Rec.*, 59 (1934), No. 3, pp. 375-381).—Varying amounts of anterior lobe extract or antuitrin S were administered to 9 rabbits during the first week of gestation. These produced corpora lutea and hemorrhagic follicles two or three times in excess of the original corpora lutea formed at mating. Injections during the first week after mating did not interrupt gestation or delay implantation.

Studies on the effect of pregnancy on the ovary, H. SELYE, J. B. COLLIP, and D. L. THOMSON (*Anat. Rec.*, 58 (1934), No. 2, pp. 139-143, figs. 3).—The ovaries of 10 female rats hypophysectomized during the latter half of pregnancy showed that the corpora lutea of pregnancy were not altered, but there were signs of hormone deficiency in the thecal cells which could be largely prevented by the administration of the gonadotrophic hormone from the anterior pituitary or the urine of pregnant women.

Responses of the reproductive system of hypophysectomized and normal rats to injections of pregnancy-urine extracts, I, II, P. E. SMITH and S. L. LEONARD (*Anat. Rec.*, 58 (1934), No. 2, pp. 145-173, pls. 2; 175-203, pls. 2).—Two papers in this series dealing with the influence of injections of pregnancy-urine extracts from 3 sources are presented:

I. *The male*.—Pregnancy-urine extract injections started immediately after hypophysectomy of immature male rats profoundly slowed the loss in weight of the testes and caused material enlargement when not initiated until after atrophy had set in. Pregnancy-urine extracts administered to the hypophysectomized animals usually caused enlargement of the accessory reproductive glands for 20 days, but when continued longer retrogression followed. The enlargement of the testes of hypophysectomized individuals resulting from treatments with pregnancy-urine extracts was associated with active spermatogenesis and the presence of normal sperm in addition to the hypertrophy of the interstitial tissue. Mating ability and fertility were also maintained in these animals. Administration of from 10 to 50 rat units of the pregnancy-urine extracts daily to normal mature and immature males for from 8 to 62 days did not hasten maturity or interfere with normal mating or fertility.

II. *The female*.—Similar tests with immature hypophysectomized females showed that the pregnancy-urine extracts caused enlargement of the ovaries if administered after retrogression had set in, or maintained the size when treatment started immediately after hypophysectomy. The enlarged size of the ovaries was associated with hypertrophy in the interstitial cells. The development of the follicular cysts and blood follicles present in normal female animals to which pregnancy-urine extracts were administered was characteristically absent. Evidently the hypophysectomized females produced estrin, and there was an enlargement of the uterus and opening of the vagina associated with it as in normal animals. Certain newly formed bodies appearing strikingly identical with corpora lutea were observed in the ovaries. Pregnancy-blood serum was found to have a physiological action similar to that of pregnancy urine.

The effect on the weight of the offspring of administration of antuitrin G to the pregnant rat, L. W. SONTAG and P. L. MUNSON (*Amer. Jour. Physiol.*, 108 (1934), No. 3, pp. 593-598).—Daily doses of 0.5 cc of antuitrin G administered to pregnant rats from the eighth to the tenth day of gestation and 1 cc thereafter caused an increase in the birth weight of the young which continued to the fiftieth day of age as compared with controls. Prenatal mortality, especially of the males, was also increased.

Observations on transplanted immature ovaries in the eyes of adult male and female rats, L. GOODMAN (*Anat. Rec.*, 59 (1934), No. 2, pp. 223-251, pls. 4).—Technic for implanting immature ovaries in the eyes of male and female adult rats is described. The operation was most successful in spayed females. Normal vaginal cycles and follicle and corpora lutea formation were observed. No corpora lutea were found in the implantations on males, although the incidence of successful implants was high without demonstrable deleterious effects on the testes.

The distribution and source of oestrin in the pregnant mare, H. R. CATCHPOLE and H. H. COLE (*Anat. Rec.*, 59 (1934), No. 3, pp. 335-347).—Data are presented from studies made at the University of California on the estrin content of the placenta, gonads, liver, kidneys, and blood of fetuses; and urine, kidneys, liver, serum, ovaries, and endometrium of pregnant mares and mares at term. The data show a large amount of the hormone present in these organs and tissues, particularly in the mare serum and ovaries and fetal liver, gonads, kidneys, and blood.

Can mammalian eggs undergo normal development in vitro? G. PINCUS and E. V. ENZMANN (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 2, pp. 121, 122).—In studying the development of rabbit ova in vitro, an account is given of a case in which 10 ova were recovered from the Fallopian tubes of an agouti doe 13

hours after copulation with a vasectomized English-spotted buck. The ova were fertilized in vitro by sperm from a self-colored nonagouti black male and later transferred to the Fallopian tube of a New Zealand Red doe rendered pseudopregnant by a previous mating with a vasectomized English-spotted male. Seven dark gray young were produced, demonstrating the fertilization of the rabbit ova in vitro.

In another case 5 ova in the 1-cell stage were cultured in Carrel flasks for 20 hours and transferred to the left Fallopian tube of a pseudopregnant doe. Two young were produced.

These experiments also demonstrate that the corpora lutea of pseudopregnancy are fully functional.

FIELD CROPS

[Crop production research in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 33 (1932), pp. 27-31, 33-45, 68, 71-74, 76, 84, 85, 108-110, 117-119).—Papers of agronomic interest presented at the convention of the Association of Agricultural Workers at Birmingham, Ala., February 2 to 4, 1932, included Fertilizer Placement Results of Georgia Tests, by G. A. Crabb (p. 27); Co-operative Fertilizer Placement Tests with Cotton in Seven States, 1931, by G. A. Cumings and W. H. Sachs (pp. 27, 28); Report of Experiments with *Lespedeza sericea*, by C. A. Mooers (p. 28); Response of Certain Soil Types to Various Rates of Application of Calcium Arsenate, by W. R. Paden (p. 29); Response of Some Common Field Crops to Various Rates of Application of Calcium Arsenate to Several Soil Types, by W. B. Rogers (pp. 30, 31); Fertilizer Placement Experiments with Cotton at the Georgia Experiment Station, by G. A. Hale (p. 31); New Measures of Rainfall, Temperature, and Soil Richness for Crop Production, by P. Tabor (pp. 33, 34); Determination of the Rate of Decomposition of Organic Matter under Field Conditions, by M. B. Sturgis (p. 34); The Correlation Between the Truog Phosphate Method and Phosphate Response, by F. L. Davis and G. D. Scarseth (pp. 34, 35); Relation of Ash Constituents of Carpet Grass from Fertilizer Plots to the Oxidation-Reduction Potentials of the Metallic Nutrient Elements, by H. P. Cooper, J. H. Mitchell, and E. D. Kyzer (pp. 35, 36); The Effect of Fertilizers and Rainfall on the Length of Cotton Fibers, by E. B. Reynolds and D. T. Killough (p. 36); Limestone in Mixed Fertilizers for Cotton, by R. P. Bledsoe (pp. 36, 37); Soil Types a Factor in Crop Production, by G. A. Crabb (p. 37); Relation of Fertilization and Selling Price to Profitableness in Cotton Production, by C. B. Williams (p. 38); The Lime Requirement of South Carolina Soils and its Relation to the Hydrogen-Ion Concentration of Their Soil Solution, by G. H. Collings (pp. 38, 39); Importance of the Chemical Analysis of Soils Used for Fertilizer Experiments, by G. S. Fraps (pp. 39, 40); Some Factors Affecting the Length of Lint of Cotton, by D. G. Sturkie (pp. 40, 41); The Present Status of Peanut Breeding, by F. H. Hull (pp. 41, 42); Suggestions Regarding Small Grain Nursery Technique, by C. B. Cross (p. 42); The Possible Causes of Undulating Subsoil-Surface Soil Lines in Some Texas Soils, by W. T. Carter (pp. 43, 44); Soil Types as a Factor in Crop Production, by G. A. Crabb (pp. 44, 45); A Method of Studying Soil Erosion, by M. L. Nichols and H. D. Sexton (p. 68); Experimental Tests Comparing the Quality of Machine-Snapped Versus Hand-picked Cotton, by D. W. Teare (pp. 71-74); The Effect of Fertilizer on the Yield and Composition of Permanent Pastures, by E. C. Elting (p. 76); Pasture Fertilizing Experiment, by J. L. Fletcher and R. H. Lush (pp. 84, 85); Progress Report of Pasture Fertilization at the Virginia Agricultural Experiment Station, by A. D. Pratt (p. 85); Factors Con-

cerning the Growing of a Late Crop of Potatoes in Oklahoma, by G. W. Cochran (p. 108); Experimental and Field Results with North Carolina No. 1 Improved Strain of Porto Rico Sweet Potato, by R. Schmidt, E. B. Morrow, and H. R. Niswonger (pp. 109, 110); and A Summary of Recent Potato Investigations in Louisiana, by J. C. Miller and W. D. Kimbrough (pp. 117-119). Most of these are in summary form, and a number have been reported in full elsewhere.

[Experiments with field crops in Florida] (*Florida Sta. Rpt. 1933*, pp. 28-31, 32-40, 45-55, 74, 97-99, 129-134, 162-164, 180, 181, 183-188, 191-194, 199, 201-204, 206-208, figs. 2).—Investigations with field crops (E. S. R., 69, p. 199), by W. E. Stokes, J. P. Camp, J. D. Warner, F. H. Hull, G. E. Ritchey, R. M. Barnette, W. A. Leukel, M. R. Ensign, W. A. Carver, R. R. Kincaid, R. M. Crown, L. O. Gratz, A. Daane, B. A. Bourne, F. D. Stevens, H. S. Wolfe, and W. M. Fifield, again reported on from the station and substations included breeding work with corn, cotton, peanuts, and sugarcane; variety trials with corn, oats, rye, cotton, sorgo, sugarcane, peanuts, potatoes, tobacco, crotalaria for pasture and silage, alfalfa, sweetclover, miscellaneous forage and pasture grasses and legumes, and winter cover crops; variety-time-of-planting tests with cowpeas and soybeans; fertilizer tests with corn, oats, rye, cotton, sugarcane, potatoes, Napier grass, Austrian winter peas, and vetch and other legumes for green manure; date and rate of planting and turning under winter legumes for corn and their phosphorus needs and effects on following crops; soil amendment studies with potatoes and peanuts; cultural (including planting) trials with corn, cotton, grain sorghum, sugarcane, potatoes, peanuts, clover, sunflowers, buckwheat, fiber crops, velvetbeans, and crotalaria; a photoperiodism experiment and study of effects of sulfur dusting cut sets with potatoes; germination studies with tobacco seed; seed storage tests; effect of ethylene chlorohydrin on boenting in sugarcane; estimation of sugarcane damage by rats; and crop rotations using winter legumes. Pasture research dealt with effects of fertilizers and frequency of cutting on yield and composition of grasses; comparisons of native v. improved, burned v. unburned pastures, and of methods of preparing land before seeding; fertilizer, lysimeter, and nitrogen accumulation studies with pasture grasses; the growth behavior of and influence of different fertilizer formulas on yields of Bahia grass; and pasture studies on peat and muck soils. A number of the projects were in cooperation with the U. S. Department of Agriculture.

[Field crops work in Hawaii] (*Hawaii Sta. Rpt. 1933*, pp. 5-9, 10-12, 26, figs. 2).—Experiments at the station and Haleakala Substation for which results are reported briefly included breeding work with pigeonpeas; variety tests with legumes for cover and green manure crops, soybeans for seed, forage, and culinary properties, potatoes, and sweetpotatoes; trials of miscellaneous forage grasses and legumes; the composition of pasture grasses and their response to fertilizers and cultivation; fertilizer tests with potatoes; and a production test of marrow-stemmed tree kale for forage.

[Field crops research in Utah], D. W. PITTMAN, D. G. TINGEY, A. F. BRACKEN, J. W. CARLSON, L. WILSON, I. D. ZOBELL, J. A. EAGAR, G. WHORNHAM, B. F. HULME, J. E. GREAVES, C. T. HIRST, and R. J. BECRAFT (*Utah Sta. Bul. 250* (1934), pp. 16-18, 19, 20, 21-24, 25, 26, 27, 28, 29, 31, 44, 61, 62).—Progress is reported from continued agronomic experiments (E. S. R., 68, p. 183), carried on at the station and substations for the biennium ended June 30, 1934, including variety trials with spring and winter wheat, oats, barley, corn, grain sorghum, sorgo, field beans, potatoes, alfalfa, and miscellaneous forage grasses and legumes for hay and pasture; cultural tests with sugar beets, stock beets,

and seed bed preparations for cereals and peas; studies of effects of different rates of manuring and irrigation on land in continuous corn and fallow; residual effects of fertilizers, soil amendments, and manure on a highly calcareous dolomitic soil and on yields and quality of crops grown; fertilizer trials with various farm crops; crop rotations; weed control with tillage and chemicals; and range reseeding experiments, including a spacing test with mountain brome grass and depth of planting bluestem wheatgrass. Other alfalfa studies considered climate, especially air temperature and relative humidity, soil moisture, soil type, and field practice and pollination as factors in seed production. Wheat experiments also dealt with tillage, seed treatments, planting methods, manuring, green manuring, stubble burning, yields in rotations and alternate cropping, and the mineral content of the grain of different varieties. Several lines of work were in cooperation with the U. S. Department of Agriculture.

The nodules of leguminous plants, their form and effect in different strains [trans. title], G. BRÄLFVE (*K. Landtbr. Akad. Handl. och Tidskr.*, 72 (1933), No. 3, pp. 393-433, figs. 5; *Eng. abs.*, pp. 430-432).—Strain differences observed in root systems and size and set of nodules when different strains of vetch were grown on several media and inoculated with several strains of bacteria isolated from *Vicia* suggested the possible existence of a heritable factor influencing nodulation, as in size and situation, which in time affects yield.

Grazing and manurial trials on permanent and prepared swards and factors affecting seed production of red clover (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.]*, Ser. H, No. 11 (1921-1929), pp. [51]+91, figs. 5).—The first three articles—The Yield of Sharply Contrasting Pasture Types and Their Response to Manures, by R. G. Stapledon and M. T. Thomas (pp. 3-26), The Effect of Manures on the Nitrogen and Mineral Content of Upland and Lowland Pastures, by T. W. Fagan and A. L. Provan (pp. 27-37), and The Effect of Varying the Periods of Rest in Rotational Grazing (E. 93. Spring Field), by M. G. Jones and L. I. Jones (pp. 38-59)—refer to preliminary experiments in pasture management to be supplemented by more elaborate research. The article by R. D. Williams, entitled Some of the Factors Influencing Yield and Quality of Red Clover Seeds (pp. 60-91), reports studies showing that red clover seed crop ripen very unevenly, due to variations in blooming, that rate of seed development depends largely upon the date of pollination, and that for best quality of seed the crops evidently should be cut about 5 to 6 weeks after full bloom. Information is also given on the effects of overripeness and immaturity on quality, the relation of varietal, seasonal, and individual plant differences and color to seed weight, on variation in hard seed production by individual plants, and correlations among germinability, germination energy, number of hard seeds, and weight of seeds.

Putting green grasses and their management, H. F. A. NORTH and T. E. ODLAND (*Rhode Island Sta. Bul.* 245 (1934), pp. 44, figs. 4).—Extensive trials of numerous strains of velvet, colonial, and creeping bents and several other grasses for adaptation and quality of turf produced, a fertilizer and liming test with four classes of bents, and studies of the control of weeds and diseases and insect pests affecting turf are reported on, with descriptions of several strains of bent and a suggested system for maintaining putting green turf in Rhode Island.

The fine bents were the only grasses found suitable for producing turf of the desired quality. Bluegrass, fescue, redtop, and several poor strains of creeping bent proved unadapted for greens in the region when clipped as close as 0.25 in. The velvet bents as a class were rated higher in quality than the

colonial bents. However, the velvet bents varied rather widely in quality and only exceptional strains were rated higher than the average of the colonial bents. The outstanding varieties were B. P. I. 14,276, Kernwood, Mountain Ridge, and Valentine No. 2. The three types of colonial bent tested differed in the prevalence of rhizomes, color of foliage, and production of nap. Differences in the quality of the turf and its susceptibility to brown patch were found in the different strains of common colonial bent. As a group the colonial bents have been the most vigorous in growth. Creeping bents were rated lower in putting green qualities than the colonial bents. Stolon creeping bents as a group were of about the same value as the lots of seaside creeping bents tested, although the wider variations in quality were found among the stolon strains such as Washington and Virginia.

Turf of velvet and creeping bents grown from seed resembled in quality that produced from stolons of the same strain. Likewise the turf of colonial bent and seaside creeping bent from seed grown in Rhode Island one generation produced turf very similar to that of parent grasses. The seeded turf usually was found more susceptible to disease than the parent stolon turf.

Fertilizer treatments used—usually an application of ammonium sulfate alone or a complete fertilizer about once a month from April to October, inclusive—and soil reactions maintained (pH from 4.8 to 5) seemed to have been generally satisfactory for most of the bent grasses. Lime was found beneficial on plats that had become very acid. Creeping bents as a class were less tolerant of acid-soil conditions than were velvet or colonial bents and also required heavier or more frequent composting.

The velvet bents were rather generally susceptible to dollar spot and colonial bent to brown patch, while creeping bents were mildly susceptible to both diseases. Snow mold was found in creeping bent turf. Disease control obtained with mercurial fungicides is tabulated for each species of bent, and general instructions are given for the control of dollar spot, brown patch, snow mold, and scald.

Bluegrass webworm was best controlled with a spray of from 1 to 2 lb. of lead arsenate in from 10 to 20 gal. of water per 1,000 sq. ft. Measures for control of earthworms, June beetle grubs, and ants are also outlined.

Crabgrass, attributed to the use of weedy compost, has been the worst weed in the plats. It was observed that the quantity of lead arsenate required to control earthworms would also control mouse-ear chickweed. Clover and other weed pests were largely controlled by the applications of ammonium sulfate. Equipment for sterilizing soil and compost by steam is described.

The prairie, J. E. WEAVER and T. J. FITZPATRICK (*Ecol. Monog.*, 4 (1934), No. 2, pp. 109–295, figs. 121).—"The present study treats of the structure of the vegetation in the several types of prairie, the secondary grasses, the ecology of the forbs, together with a general survey of contacts, invasion, and succession." See also another and earlier contribution from the University of Nebraska (*E. S. R.*, 67, p. 235).

The establishment, persistency, and productivity of selected pasture species on an irrigated reclaimed swamp, H. C. TRUMBLE and J. G. DAVIES (*Aust. Council Sci. and Indus. Res. Bul.* 80 (1934), pp. 32, figs. 6).—Trials of species, strains, and mixtures demonstrated the worth of simple mixtures of permanent strains of perennial ryegrass, white clover, and red clover. Such mixtures yielded about twice as much as the best pure perennial ryegrass and 77 percent better than alfalfa cut every 56 days.

Soil, field-crop, and pasture management for Herkimer County, New York.—II, The improvement and management of permanent pastures, D. B. JOHNSTONE-WALLACE (*[New York] Cornell Sta. Bul.* 612 (1934), pp. 35–77,

figs. 26).—The types of pastures in Herkimer County, N. Y., their botanical composition, the mineral composition of their herbage, and the plant food needs of important soil types are described and suggestions are made for their improvement by fertilization, seeding with or without plowing, grazing management, and for the supplementary feeding of cows on pasture.

Cereal grain crops for annual pasture, L. E. KIRK, J. G. DAVIDSON, and S. N. HAMILTON (*Sci. Agr.*, 14 (1934), No. 10, pp. 569–579, *figs. 8*; *Fr. abs.*, p. 579).—When cereals were compared in 1932 and 1933 at Indian Head, Saskatchewan, as to yield, feed value, and use as annual pasture crops, oats always surpassed barley, wheat, and spring rye, in order, in acre yield of dry matter and protein percentage, but had a lower dry matter percentage. Oats outyielded the other grains in the same order in total yield of protein and by larger margins in early than in late seedings, and also produced more cuttings in each season. The total pasture yield of all crops increased and the percentage protein decreased as the first date of cutting was delayed. Oats furnished its largest yields of protein per acre when pasture cuttings were begun at the 5-leaf stage. Oats from early seeding produced 3,000 lb. of dry matter per acre with an average protein content of 25 percent, which exceeded a carrying capacity obtained at Ottawa on good quality native bluegrass sod.

Alfalfa varieties in the United States, H. L. WESTOVER (*U. S. Dept. Agr., Farmers' Bul. 1731* (1934), pp. II+14, *figs. 4*).—The history, cultural status, characteristics, and adaptations of the principal varieties included in the common, Turkistan, variegated, and nonhardy groups of alfalfa are summarized, with remarks on varieties for different sections of the United States and safeguards in buying seed. This is a revision of and supersedes Farmers' Bulletin 1467 (*E. S. R.*, 55, p. 32).

Improvement of alfalfa seed production by inbreeding, H. M. TYSDAL and I. CLARK (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 773–780).—Alfalfa inbreeding studies carried into the third and fourth selfed generations by the Nebraska Experiment Station and the U. S. Department of Agriculture showed that decreases in seed production may be expected in a general selfing program. Rigid selection of advanced generations for this character resulted in actual increases in seed production in self-pollinated lines. While all high seed-producing plants did not breed true for high seed production, enough inherited this character, particularly in advanced generations, to furnish decided increases. The seed production of the same strains under different environmental conditions suggested that higher temperatures, perhaps alternating temperatures, and a high percentage of total sunshine may be important factors in seed production.

Adapted red clover for New Jersey, H. B. SPRAGUE (*New Jersey Stat. Circ. 330* (1934), pp. 4).—The superiority of adapted red clover to alsike for New Jersey, the inferiority of foreign seed compared to native strains, the merits of adapted American clover, especially from Ohio and nearby States and Tennessee anthracnose-resistant seed, and the value of buying certified seed of superior strains are pointed out, with brief suggestions on producing red clover seed in New Jersey.

Influence of adjacent plats in variety tests with corn [trans. title], N. SĂULESCU and B. GLUCO (*An. Inst. Cercet. Agron. României* (*Ann. Inst. Rech. Agron. Roumanie*), 5 (1933), pp. 241–252; *Ger. abs.*, pp. 251, 252).—The comparative development and yields of plants in border and central rows of plats of corn varieties suggested that only corns similar as to time of maturity should be planted in adjoining plats. Border rows should be discarded during harvest, especially between varieties differing much in growth characteristics.

Second conference on cotton growing problems, July 1934—Report and summary of proceedings (London: Empire Cotton Growing Corp., 1934, pp. 340, figs. 16).—The proceedings of the second conference of British Empire cotton workers (E. S. R., 69, p. 43), held July 18–20, 1934, in London, are reported. Papers of interest to agronomists and plant breeders, presented with discussion, included The Practical Application of Genetical Science to Plant Breeding, by A. E. Watkins (pp. 14–22); The Value of Inter-Specific Hybrids in Cotton from the Standpoint of Genetics (pp. 22–30) and Selection Effects in Pure Lines of Sea Island Cotton Self-Fertilized for Seventeen Generations (pp. 31–46), both by S. C. Harland; Cyto-Genetics in Relation to Plant Breeding in Cotton, by A. Skovsted (pp. 46–51); Preliminary Testing of New Varieties or Types of Cotton, by T. Trought and H. E. King (pp. 51–60); Cotton Breeding Problems in Northern Nigeria (pp. 60–67); The Cotton Problems of Kenya (pp. 68–73); Purity Targets, by C. G. Hansford and J. D. Jameson (pp. 74–78); The Observation, Measurement, and Recording of Crop Loss and Crop Yield (pp. 78–83); Analysis of Variance and Analysis of Co-Variance, Their Meaning, and Their Application in Crop Experimentation, by J. Wishart (pp. 83–96); Sampling and Growth Observations in Plant Development Studies on Cotton, by O. V. S. Heath (pp. 96–110); The Health and Vigour of the Cotton Plant in Relation to its Environment, by F. K. Jackson (pp. 199–206); Some Outstanding Physiological Problems in the Culture of Cotton in the Sudan, by F. G. Gregory (pp. 206–222); Physical Measurements of Soil in Relation to Soil Type and Fertility, by B. A. Keen (pp. 311–319); and Soil Organic Matter and Crop Rotation, by E. M. Crowther (pp. 319–339).

Cotton pests and diseases were considered in papers entitled Field Studies on the Relation of Insect Pests to Climatic Conditions, with Special Reference to Cotton, by C. B. Williams (pp. 111–125); Climatic and Soil Factors in Relation to Prevalence of, and Damage by, Insects—Possibilities of Reduction of Loss of Crop Due to Insects, by the Selection and Restriction of Sowing Periods and by the Propagation of Cotton Strains Better Adapted to Local Conditions, by H. Hargreaves (pp. 125–131); Investigations on Insect Pests of Cotton, by F. S. Parsons (pp. 131–135); Investigations on the American and the Red Bollworms of Cotton, by F. S. Parsons and G. C. Ulyett (pp. 135–146); Investigations on Cotton Stainers and Internal Boll Disease, by E. O. Pearson (pp. 146–155); The Interrelationship of Wild Host Plants and Cotton with Reference to Variation in Stainer Population in Northern Rhodesia, by A. G. Bebbington and W. Allan (pp. 156–167); Problems Connected with the Control of the Pink Bollworm (*Platyedra gossypiella*, Saunders) in the Sudan, by H. W. Bedford (pp. 167–175); Angular Leaf Spot and Blackarm of Cotton Caused by *B. malvacearum* E. F. S., by R. E. Massey (pp. 175–178); Blackarm Disease in Uganda, by C. G. Hansford (pp. 178–195); and Leaf Curl Disease of Cotton in the Fiji Islands, by R. R. Anson (pp. 195–198).

A symposium on fiber properties of cotton embraced Studies in Variability of Cotton with Special Reference to Immaturity, by F. T. Peirce and E. Lord (pp. 223–252); The Most Troublesome Impurities in Cotton—Bearded Motes and Neps, by G. G. Clegg (pp. 252–266); A General Review of Spinning Tests on Empire Cottons, by C. Underwood (pp. 267–280); The Relation Between Fibre Properties and Spinning Value, by A. J. Turner and C. Underwood (pp. 280–294); Brokers' Reports on Cotton Samples (pp. 294–297), The Effect of Type of Gin on the Spinning Properties (and hence Value) of Uganda Cotton (pp. 297–302), and The Tobler Bale Sampler for Lint Grading Purposes (pp. 302–306), all by H. R. Hosking; and Progress Note on Measurement of Moisture in Bales by Radio Technique, by W. L. Balls (pp. 306–310).

Iarovization of cotton [trans. title], N. P. ZINICHENKO (*Bor'ba Khlopok*, No. 2-3 (1933), pp. 182-188, fig. 1).—Vernalized seed of American cotton varieties hand-sown just after treatment emerged earlier, growth, square formation, blooming, and ripening were accelerated, bolls were larger, and substantial yield increases over controls usually were obtained. Even seed dried to normal moisture content and planted about 15 days after treatment gave good yield increases. It seemed feasible to drill iarovized seed if germination is not too advanced.—(*Courtesy Biol. Abs.*)

Iarovization of cotton [trans. title], A. N. TASHLANOV and Z. M. PULOVKINA (*Bor'ba Khlopok*, No. 1-2 (1934), pp. 150-155, figs. 2).—Seedlings from vernalized cottonseed emerged several days before controls, and certain Egyptian and American varieties respectively bloomed from 3 to 6 and from 1 to 3 days earlier and ripened from 5 to 11 and from 2 to 4 days earlier than controls. Substantial yield increases were noted in the first pickings, depending on variety. Usually no differences were noted in boll size and fiber length and percentage. Varietal differences were evident.—(*Courtesy Biol. Abs.*)

The value of single lock samples as a measure of seed purity in cotton, J. H. MOORE (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 781-785, figs. 2).—Results obtained by the North Carolina Experiment Station in 1933 indicated that the method of studying variability of combed staple length by picking one lock from a plant was reasonably accurate in measuring the variability of the population of four strains of upland cotton studied, although the method had limitations in measuring combed staple length variation as applied to the performance of individual plants within a variety. The correlation of combed staple length of the individual parent and progeny plants in the strains ranged from 0.416 ± 0.074 to 0.633 ± 0.06 , indicating that a considerable percentage of the variations of combed staple length was not inherent. The correlation of the standard deviations for combed staple length in the parent and progeny samples was 0.967 ± 0.032 .

The analysis of variance method of measuring differences between staple-length designations of press-box and cut samples of cotton, F. H. HARPER and W. B. LANHAM (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1933, pp. [2]+29).—The average of staple-length designations of samples cut from cotton bales slightly exceeded that of staple length designations of samples taken from the gin press-box. Differences between staple length designations of press-box and cut samples from the same bales were very inconsistent, but at least a part of such inconsistency might be accounted for by the element of tolerance. Inconsistency of differences in staple length distribution with either group of samples as the base was so great that variability contributing to bias or difference, on the whole, between the two series of staple length observations was negligible compared with variability associated with inconsistency in staple length designations. Discussions on the measurement of average differences in two series of observations and on the analysis of variability in replicate observations are appended.

Action of an electric current on cottonseed [trans. title], I. I. IAKOBSON (*Bor'ba Khlopok*, No. 1-2 (1934), pp. 156, 157, fig. 1).—Passage of a 0.05-ampere current through cottonseed soaked in a sodium chloride solution is said to have accelerated germination 2 to 3 days, and in experimental plants increases of from 10 to 20 percent in bolls per plant and from 9 to 20 percent in seed cotton per boll over controls were reported. Limitations of the method are indicated.—(*Courtesy Biol. Abs.*)

Cold resistant potato varieties [trans. title], G. M. KOVALENKO (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, Ser.

A, No. 3 (1932), pp. 127-130).—Cultivated varieties from Peru and Bolivia and several native species were especially resistant when subjected to -5.1°C . (22.8°F). Varieties found most resistant included *Solanum juzepczukii*, *S. ajanhuiri*, *S. curtilobum*, a type of *S. andigenum*, *S. acaule*, *S. bukasovii*, *S. demissum*, and several interspecific hybrids. Intravarietal differences also were noted. See also another note (E. S. R., 72, p. 41) by Bukasov.

Effect of size of seed piece of Irish potato on recovery from freeze injury, W. D. KIMBROUGH and D. COSTA (*Louisiana Sta. Bul.* 254 (1934), pp. 12).—Sets of Triumph potatoes, cut to 0.5, 0.75, 1, 1.5, and 2 oz., were planted January 15 and February 21. The early planting was frosted when about 1 to 3 in. high and also when the plants began to grow again, while the later planting was not harmed by frost. When early plantings had small marble-sized tubers and 1 week after late plantings were up, half of the plants of each lot were cut off even with the ground to simulate a freeze. Sets were removed for analyses at intervals during growth.

Yields, and to some extent recovery after freeze injury, varied with the size of set planted. While the larger sets outyielded smaller sets, crops from plants cut back when tubers were very small were of no consequence. Cutting back 1 week after plants marked the row reduced yields markedly. With uncut plants the larger yields came from the late planting. The dry matter in the sets, largely food reserves of starch, dropped from 23 percent before planting to 3-3.5 percent 3 weeks after the plants came up, when practically all reserves had been used. The percentage composition of food reserves was maintained at a higher level in the larger sets for a short time. The greater recovery by plants from larger sized sets cut back 1 week after coming up, it is suggested, might be due to greater sprout production with fewer hills killed entirely or more vigorous sprouts. A practical suggestion is to delay planting until frost danger is past, with 1.5-oz. sets preferred to smaller sets so far as recovery from freeze injury is concerned.

Studies of the effects of storage temperature on the propagation value of potato tubers, J. D. HARTMAN ([*New York*] *Cornell Sta. Mem.* 168 (1934), pp. 39, pls. 3, figs. 9).—Tubers of a line of Green Mountain potatoes stored at 50°F . after they produced fairly large sprouts and tubers stored at 32° seemed to lose moisture faster than tubers stored at 40° and 35° under conditions favorable for evaporation of equal quantities of water from a free water surface. This held true for tubers stored at 50° , even after sprouts were removed. The plants grown from tubers stored at 32° produced more stalks and more tubers per plant than plants from tubers stored at 40° or 35° for the same period. A constant temperature of 40° appeared better for storage of seed potatoes than 35° , which in turn seemed better than one of 32° maintained up to planting.

With about the same weather conditions, yields of plants were nearly proportional to numerical differences between the number of days that plants had some green foliage and 42 days. Departures from this rule were in the right direction, and apparently of such magnitude that they appeared due to plant competition and removal of one crop of sprouts. Because plants from tubers planted at the same time died at about the same time, yield depended greatly on the number of days after planting that plants came up. For given soil conditions, the time required for tubers to produce plants in the field was determined almost wholly by the average size of sprout developed in storage. The propagation value of potatoes stored at different temperatures depended primarily on the size of sprout developed, and secondarily on whether desprouting was practiced. A sprout as large as possible which does not pro-

trude so far out of the eye that its tip may*be damaged badly or which is protected from injury by greening is considered the chief desirable character of healthy seed tubers at time of planting.

Buds at the beginning of storage were characterized by the presence of large tannin vesicles in the cells at their bases, and large white sprouts developing in the 50° and 40° storages were characterized by the presence of small starch grains in the cortex and pith. Histological and microchemical differences found in sprouts from different storages appeared to be correlated closely with the size of sprout. Storage temperature seemed to affect growth rate but not type of growth of sprouts. The older tissues of green sprouts contained more tannin and solanin than the older tissues of white sprouts. Most of the surface of green sprouts was covered by a well developed layer or two of suberized cells, whereas white sprouts had a layer of suberized cells only at their bases.

Study of field plot technic showed it possible to obtain an average probable error of the single observation as low as 2.6 percent in field experiments. Plots consisted of single rows 90 ft. long, planted with 75 or 100 whole tubers, and on each side of each plot a check row was planted and used in making corrections for soil variation. This method is adapted for determining accurately mean differences of 7 percent or less between treatments. Competition between plots affects the results obtained.

The fall crop of Irish potatoes (*Alabama Sta. Leaflet 11 (1934), pp. 4*).—Practical suggestions for growing the fall crop of potatoes in Alabama, based largely on station experiments, are given on varieties and seed sources, methods of shortening the rest period and hastening sprouting, planting dates, and soil, cultural, and fertility needs.

Wild rice of Kwangtung and new variety bred from the hybrids of wild rice with cultivated rice, Y. TING (*Sun Yatsen Univ., Col. Agr., Agron. Bul. 3 (1933), pp. 25, pls. 3*).—The characteristics and distribution of wild rice (*Oryza sativa* var.) in Kwangtung are described, with accounts of pedigree cultures and the segregation of hybrids, especially in tiller type, awning or color of leaf sheath, inner glumes, and kernel. Yatsen No. 1, the new variety, is said to surpass other cultivated sorts in vigorous growth and tillering and in enduring low temperatures and high soil acidity.

The sterile flower of wild rice (*Oryza sativa* L.) of Kwangtung [trans. title], L. T. LIN and Y. TING (*Sun Yatsen Univ., Col. Agr., Agron. Bul. 4 (1934), pp. 54; Eng. abs., pp. 23-26*).—Morphologically the flowers of wild rice did not seem to differ much from those of cultivated rice except for their larger anthers and stigmas and elongated pollen grains. Incomplete anthesis and poor germination of pollen appeared to be the main causes of sterility in the wild rice.

Agronomic evaluation tests on mechanical blocking and cross cultivation of sugar beets, A. W. SKUDERNA, H. E. BREWBAKER, C. E. CORMANY, C. A. LAVIS, S. B. NUCKOLS, C. PRICE, F. R. IMMER, J. O. CULBERTSON, G. W. DEMING, and E. M. MERVINE (*U. S. Dept. Agr. Circ. 316 (1934), pp. 23, figs. 3*).—Results obtained in cooperative experiments in several Western States in 1931-32, wherein mechanical (E. S. R., 70, p. 258) and hand blocking of sugar beets were compared, indicated that so far as the study had gone, mechanical blocking, if done carefully on fields where the stand is adequate and the seed bed suitable, is entirely practicable and may improve rather than depress yields. Mechanically blocked plots showed generally favorable yield results when a space allotment per plant approaching the standard (240 sq. in.) was used. The results indicated that no detrimental effects are to be expected from blocking a number of days before thinning provided that soil moisture is adequate

for the needs of the small beet plants. Response of cross cultivation appeared to be conditioned by the importance of the weed factor, and the cultivations in themselves did not seem to influence yield or quality greatly. A chart showing the proper spacing of tools on the cultivator to obtain a certain percentage stand of blocked beets is presented.

Sugarcane breeding and cultivation in Florida, R. L. DAVIS (*Puerto Rico Sta. Agr. Notes* No. 67 (1934), pp. 3).—The behavior of the principal varieties of sugarcane grown is described briefly, and methods used for control of rats with baits of wheat poisoned with thallium sulfate, in making preharvest analyses, and in testing and analyzing seedlings are outlined.

Studies on the germination of sugarcane cuttings, R. H. KING (*Sugar News*, 15 (1934), No. 6, pp. 315-320, figs. 13).—Initial germination of sugarcane sets requires 5 weeks during the cool winter months in the subtropical delta region of Canton, China. A. L. Bantug, working at the Philippine College of Agriculture, observed that germination or weight of shoot development were not increased by soaking 1-eye cuttings of P. O. J. 2878 in solutions of certain chemicals. Soaking in water for 12 hr. and a solution reaction of pH 6 to 7 gave best results. Cuttings in the field at Canton covered with ash of bagasse and rice straw germinated 3 weeks before those covered with soil.

The results of cultivation tests with sugarcane [trans. title], E. DEMANDT (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus.*, 1934, No. 4, pp. 111-140, fig. 1; *abs. in Internatl. Sugar Jour.*, 36 (1934), No. 428, p. 320).—Sugarcane in Java is planted in a trench 8 to 12 in. deep which is filled in gradually after germination until the soil finally is ridged against the base of stalks. Average results of 129 field experiments showed the combination of three fillings, hilling, and clean cultivation to result in about 15 percent more cane and sugar than simply leveling the ground after the cane was well developed. Less intensive cultivation gave somewhat smaller gains than the best method.

Root distribution of sugar-cane in different soils in Trinidad, F. HARDY (*Trop. Agr. [Trinidad]*, No. 10 (1933), No. 6, pp. 164-172, fig. 1).—The root distribution of plant and ratoon canes of the B. H. 10 (12) and Uba varieties grown in light and heavy soil was examined by the soil core method. No simple relationship was evident between root weight and crop weight (stool-stem weight) of sugarcane growing in Trinidad. The roots of ratoon canes appeared more superficial than those of plant canes and roots of Uba canes generally more superficial than roots of B. H. 10 (12) canes of the same stage of growth. The effect of soil texture was not very marked; the weight of roots produced in heavy soil tended to exceed somewhat that in light soil. Vertical root distribution appeared to be controlled by fluctuations in ground water level, which impress certain distinctive features on the soil profile.

Tobacco culture in Connecticut, P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul.* 364 (1934), pp. 713-810+LXI-LXV, figs. 36).—Practical information, based extensively on experience and research at the Tobacco Substation at Windsor (E. S. R., 71, p. 318) and elsewhere in the Connecticut Valley, is given on acreage and distribution, soils, seed beds and their management, preparing and fertilizing soils, setting plants, cultivating, side dressing, topping, suckering, curing, handling the crop for the market, cover crops, and on tobacco diseases and insect pests of economic importance in Connecticut and their control. A description of the construction of a shade tent, statistics on yields and acreages of different types of tobacco, and an index are appended.

Greenmanuring of tobacco with crotalaria [trans. title], D. TOLLENAAR (*Proefsta. Vorstenland. Tabak [Netherlands East Indies]*, *Meded.* 80 (1934), pp. [3]+43, figs. 5; *Eng. abs.*, pp. 41-43).—Crotalaria, preferably *C. juncea*, as

a green manure for tobacco was found to replace stable manure satisfactorily without disturbing the usual rotation and resulted in improved fire-holding capacity and a slightly more uniform, light colored, and finer quality of leaf. The length of leaf was as good, and the crotalaria contained less chlorine and phosphorus than the manure. Stacking air-dry green material seemed preferable to composting. Cultural practices are outlined.

Tests with imported seed of *Vicia villosa*, R. McKEE, H. A. SCHOTH, and P. TABOR (*Jour. Amer. Soc. Agron.*, 25 (1933), No. 8, pp. 555, 556).—Field studies of imported seed of *V. villosa*, made in 1929–31 by the U. S. Department of Agriculture cooperating with the Georgia State College of Agriculture and the Oregon Experiment Station, showed that both smooth vetch and hairy vetch are imported under the name hairy vetch, and that hairy vetch seed is produced in the more northern regions while seed of both vetches is produced in more southern areas. In general, smooth vetch will make a stronger winter growth in the Southern States than hairy vetch. It is suggested that more attention be paid to the source and type of *V. villosa* seed intended for use as green manure in the Southern States.

Field experiments with vernalized wheat, H. H. MCKINNEY, W. J. SANDO, A. F. SWANSON, V. C. HUBBARD, G. S. SMITH, C. A. SUNESON, and J. L. SUTHERLAND (*U. S. Dept. Agr. Circ.* 325 (1934), pp. 8).—Experiments with certain standard winter and spring wheats, made in 1933 in Virginia, Kansas, Nebraska, Montana, and North Dakota, to obtain information on the possible commercial value of vernalization before planting in the spring are summarized, and the merits, limitations, and possible application of the practice are discussed briefly.

Varieties of winter wheat headed when the germinated seed was chilled (vernalized) for suitable periods and sown in the spring, while little or no heading resulted from nonvernalized seed. The period required for complete vernalization (50–65 days) depended on the variety and environmental conditions after sowing. Shorter periods seemed to be needed at the northern stations than at those farther south. Earliness in the spring wheats was modified so slightly by chilling that the effect was not of practical consequence. At Langdon, N. Dak., vernalized Kanred slightly outyielded the nonvernalized Marquis controls, but produced slightly less grain than Mindum nonvernalized controls. The highest yields among the spring varieties at Langdon were obtained in the vernalized group, although the increases in yield were not large. "The information now available seems to indicate that the method does not offer great possibilities in commercial wheat production."

Lodging of wheat [trans. title]. M. PRUTZKOVA, M. LEBEDEVA, A. MELNIKOV, and S. OStanin (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, Ser. A, No. 3 (1932), pp. 67–87, figs. 20).—Examination of 17 varieties of spring wheat showed that the wheats resistant to lodging had shorter stems and especially shorter first and second lower internodes. Kitchenier and Marquis excelled in strength of culms. Anatomical examinations made during growth and after harvest are illustrated and described. Varieties not subject to lodging contained higher amounts of ether-soluble substances, hemicelluloses, cellulose, and lignin and smaller amounts of dry matter (water and alcohol extract) and sugar than the lodging varieties. No difference was noted in the quantities of ash and nitrogen.

A study of carotene content and other quality characters in a series of hybrid wheats, C. H. GOULDEN, W. F. GEDDES, and A. G. O. WHITESIDE (*Cereal Chem.*, 11 (1934), No. 5, pp. 557–566, figs. 2).—Baking tests on the flour and carotene determinations on the flour and whole wheat were made for 139

miscellaneous and new hybrid strains grown at Winnipeg in 1933. Statistical study of the relation between the carotene in the flour and that in the whole wheat indicated that carotene tests in the whole wheat might be of considerable value in breeding work if applied in early generations and continued on the progeny for two or three years. In a group of 48 strains from H-44-24 × Marquis, results resembled those for the entire series except for a negative correlation between carotene and protein. Correlations among nine quality factors are tabulated.

Handbook of instructions for the installation and operation of the Tag-Heppenstall moisture meter, D. A. COLEMAN and H. C. FELLOWS (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. 27, figs. 3*).—Practical instructions are given for the electrical determination of the moisture content of different classes of wheat, rye, eastern and western barley and oats, corn, rough and milled rice, sorghum, soybeans, and vetch.

Control of leafy spurge and review of literature on chemical weed control, H. L. BARNETT and H. C. HANSON (*North Dakota Sta. Bul. 277 (1934), pp. 32, figs. 7*).—In comparative tests during 1931-33, sodium chlorate killed leafy spurge (*E. S. R., 69, p. 364*) better than did ammonium thiocyanate, being more effective in killing the roots, although the top kill was equally good with either chemical. Mowing the weed before spraying with sodium chlorate apparently did not affect the kill obtained and is recommended because fire hazard is reduced. The methods of applying sodium chlorate seemed to make little difference in the control of leafy spurge, whereas ammonium thiocyanate in solution gave a better kill than in dry form. Three applications of the chlorate during a season were more effective than the same quantity in one application. Plats treated with sodium chlorate, 6 lb. per square rod in three applications, showed a 98-percent reduction in leafy spurge 14 mo. after the final treatment. Initial applications of sodium chlorate at blooming in early summer (mid-June) gave slightly better results than beginning later. Second and third applications should be made when the new top growth is about 3 to 4 in. high, and if needed for complete eradication, a fourth treatment should be given the next spring when the plants are from 3 to 4 in. tall.

Almost 2 yr. after sodium chlorate was applied, toxic effects were observed on corn grown in pots in soil from the second and third foot levels of treated plats. Low rainfall probably was a factor influencing the slow decomposition and leaching of the chlorate. Plants grown in a soil treated with ammonium thiocyanate were normal and apparently in the same condition as those in untreated soil. The frequency and abundance of other weed species on the plats after treatment are described.

Frequent and thorough hoeing of leafy spurge for two seasons gave good control. It appeared that on large areas thorough and frequent cultivation throughout one season, followed by well cultivated corn the second season, would effectively control leafy spurge.

The literature reviewed on chemical weed control embraced 57 titles.

HORTICULTURE

Gardener's handbook, L. H. BAILEY (*New York: Macmillan Co., 1934, pp. [3]+292, figs. 69*).—Brief suggestions are given for the growing of flowers, vegetables, and fruits in the home garden.

[Horticulture at the Florida Station] (*Florida Sta. Rpt. 1933, pp. 41-45, 86-97, 99-109, 141-149, 164, 165, 197-199, 200, 201, 204-206, 208, figs. 4*).—The results are discussed of studies in the development of new sweet corn varieties by conversion of field to sweet types, by F. H. Hull; varietal, fertilizer, propagation, cover crops, and storage requirements of pecans, by G. H. Blackmon;

varieties of grapes, zinc sulfate as corrective for bronzing in tung-oil trees, storage of narcissus bulbs, citrus hybrids, varieties of pears, avocados, and berries, and rootstocks for Satsuma oranges, all by H. Mowry; varieties of lettuce and other vegetables, by M. R. Ensign; mulching citrus, by A. F. Camp; relation of nitrogen absorption and storage to growth and reproduction in citrus and pecans, by Blackmon and Camp; the preservation of citrus juices and pulps, by Camp; cold storage of grapefruit and Valencia oranges and the effect of varying amounts of potash in the fertilizer and of various gases and absorbents on the keeping quality of grapefruit, by Camp, L. W. Gaddum, and A. L. Stahl; bud selection, propagation, hybridization, new and hybrid forms, and varieties and rootstocks for citrus, by J. H. Jeffries; and cover crops for citrus, by W. E. Stokes and Jefferies.

A brief report is given of fruit-tree trials at the Everglades Substation, by R. V. Allison, G. R. Townsend, and R. N. Lobdell.

Among studies reported at the Subtropical Substation at Homestead are trials of windbreaks and ornamental species; fertilizer needs of the avocado and varieties of orange, grapefruit, and other citrus, both by H. S. Wolfe; and the fertilizer and cultural requirements of the tomato and pepper and varieties of tomato, both by Wolfe and W. M. Fifield.

[**Horticulture at the Hawaii Station**] (*Hawaii Sta. Rpt. 1933*, pp. 9, 10, 12-20, figs. 5).—Brief reports are presented on investigations of varieties of sweet corn; varieties and fertilizer requirements of cabbage; varieties and breeding of lettuce; cultural, fertilizer, and keeping requirements of the Macadamia nut; various introduced fruits and ornamentals; citrus; native raspberries and other *Rubus* species; varieties, culture, pruning, and propagation of coffee; and the value of coffee pulp as a compost for coffee fields.

[**Horticulture at the Utah Station**] (*Utah Sta. Bul. 250 (1934)*, pp. 24, 26, 28, 31, 53-55, 56, 57).—The results are briefly discussed of vegetable trials at the Sanpete County Substation, by L. Wilson; alkali- and cold-resistant qualities of various vegetable and windbreak plants at the Carbon County Substation, by I. D. Zobel; the yields of beans, turnips, and rutabagas, and the growth of various windbreak species at the San Juan County Substation, both by J. A. Eagar; the adaptability of hardwoods in the Panguitch Valley, by B. F. Hulme; cherry understock trials near Farmington, afterripening of mazzard and mahaleb cherry seeds, and variety testing of cherries, peaches, plums, apricots, and apples, all by F. M. Coe; tomato improvement by selection, development of ear worm resistant strains of sweet corn, and onion variety standardization at the Davis County Substation; factors influencing the keeping quality of onions, use of plant protectors and paper mulch in vegetable growing, factors underlying the formation of double and scallion onions, variety testing of small fruits, and relative efficiency of various sources of heat for hotbeds, all by A. L. Wilson.

Factors influencing the growth of plants in cloth houses, W. G. PURDY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 578, 579).—Using different colored standard tobacco cloths with mesh 22 by 22 per inch, there were observed at the Ohio State University decreases of light intensity of 35, 40, and 47.5 percent under white, yellow, and red cloths, respectively. In no case was there a difference of 2° in temperature under and outside the cloth. Relative humidity was slightly greater under cloth during the hotter portion of the day.

Carbon dioxide content of the air in glasshouses [trans. title], E. JOHANSSON (*Meddel. Alnarps Trädgårdars Försöksverks. [Sweden]*, No. 35 (1934), pp. 13-20; *Eng. abs.*, pp. 19, 20).—Determinations of the carbon dioxide in greenhouses with and without additional beds of stable manure and straw indicated that the supplemental treatment increased materially the percentage

of carbon dioxide in the air. At the stage of greatest difference there was about twice as much carbon dioxide in the air of the treated house as in the control.

Anhydrous ammonia as a fertilizer, D. D. WAYNICK (*Calif. Citogr.*, 19 (1934), No. 11, pp. 295, 310, 311, figs. 2).—The direct application of ammonia to the soil resulted in a temporary sharp increase in acidity. The displacement of calcium, magnesium, and potassium by ammonium sulfate was much larger than that obtained with ammonia in equivalent quantities. Whereas not a trace of phosphoric acid was found in the leachate from soils after 10 applications of ammonium sulfate, successive applications of ammonia resulted in an increased liberation in the same soils. Nitrification of ammonia proceeded much more rapidly in all soils with ammonia than with ammonium sulfate.

The production of spring vegetables in the lower Rio Grande Valley, W. H. FRIEND and S. W. CLARK (*Texas Sta. Circ.* 72 (1934), pp. 56, figs. 5).—General information is presented on climatic and soil relations, choice of crops, essential equipment, preparation of the soil, culture, irrigation, control of pests, and the specific requirements of the principal vegetables grown.

Transplanting vegetable plants, W. E. LOOMIS (*Iowa State Hort. Soc. Rpt.*, 68 (1933), pp. 221-224).—At the Iowa Experiment Station, transplanting in the greenhouse of cabbage and tomatoes from flats into pots had no significant effect upon yields. Reduction of the number of leaves of sweetpotatoes at the time of planting reduced materially the marketable yield, particularly in a season of dry, hot weather, thus refuting the common belief that it is necessary to reduce the top in accord with root damage. Presumably if top reduction is necessary the plant adjusts itself by dropping some leaves. It is suggested that the maximum leaf area be left on transplanted vegetables, since the food manufactured in the leaves produces the new roots.

Seasonal variation in the tenderness of asparagus, J. H. MACGILLIVRAY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 558-560).—Using a fruit pressure tester with a modified plunger, the author, in studies at the Indiana Experiment Station, tested individual spears of Martha Washington asparagus at three different times during the usual spring cutting period. In 1930 there was a tendency for the stalks to become more resistant to the tester as the season advanced, but in 1931 the situation was reversed. The base of the spear was usually tougher than the tip, but it was possible to find all sorts of individual variations. There was a slight increase in toughness as the number of days required to grow a 7-in. spear increased.

Cabbage varieties, G. MORRISON, H. DREWES, and H. N. COULTER (*Michigan Sta. Spec. Bul.* 249 (1934), pp. 68, figs. 20).—This paper, prepared in greater part by plant breeders employed by a well-known Michigan seed house, presents a brief history of the cabbage; a description of its botanical characters; a review of breeding studies; a discussion of the origin and development of cabbage varieties; classification of varieties based on ripening season, color, shape, and leaf characters; and finally a descriptive account of individual varieties.

Carrot breeding experiments, H. A. BORTHWICK and S. L. EMSWELLER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 531-533).—At the California Experiment Station the introduction of flies into muslin-screened cages in which were growing individual umbels of Danvers Half Long carrot flowers failed to yield seed due to the fact that the anthers of a single umbel dehisce several days before the stigmas are receptive. On the other hand where entire plants were enclosed with flies good crops of seed were secured. Without flies only a few seeds were obtained. By introducing umbels of another variety into the cage successful hybridization was accomplished. Inbreeding of Danvers Half Long, Coreless, and Nantes resulted in a pronounced loss of vigor in the F_1 generation.

The vegetables of New York, Vol. I, pt. 3: Sweet corn, W. T. TAPLEY, W. D. ENZIE, and G. P. VAN ESELTINE (*New York State Sta., 1934, pp. V+111, pls. 24, figs. 2*).—This, the third in a series (E. S. R., 67, p. 525), presents the historical and botanical status of maize, complete horticultural descriptions of all recorded sweet and other types of corn used as vegetables, and a history of the development of these varieties.

Hybrid sweet corn for the home and market gardener, E. S. HABER (*Iowa State Hort. Soc. Rpt., 68 (1933), pp. 101-106*).—Stating that it requires from 4 to 6 yr. for a selfed line of sweet corn to become homozygous or nearly so, the author reports that in studies at the Iowa Experiment Station certain Golden Bantam recombinations outyielded the parental variety by as much as 100 percent and in addition were more uniform in ripening and also in size of ears. Similar results were secured with the Evergreen variety. The pressure test was used as a measure of uniformity.

Earworm damage in sweet corn varieties, L. R. HAWTHORN and R. K. FLETCHER (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 550-553*).—Of 22 strains of sweet corn selected in 1931 and 1932 as promising for their resistance to corn ear worm, all were found in 1933 trials by the Texas Experiment Station at Winter Haven to have 86 percent or more of infested ears. The extent of damage differed sharply with the varieties. Honey June and Surcropper Sugar with less than the average of uninjured ears produced notably high percentages of marketable ears, 84.8 and 73.3, respectively. Oregon Evergreen with 48.8 percent of marketable ears rated high.

At College Station, in a test of six varieties, Surcropper Sugar and Honey June yielded 99 and 98 percent of marketable ears. These two varieties were produced by the station (E. S. R., 71, p. 194).

Irrespective of the season or type, ovipositing by the ear worm did not occur extensively until silking was in process.

Cucumber growing in New York, W. D. ENZIE (*New York State Sta. Circ. 150 (1934), pp. 7, fig. 1*).—General cultural information is presented.

Cultural trials with hops.—I, The effect of distance of planting and number of bines per string—a progress report, F. H. BEARD (*East Malling [Kent] Res. Sta. Ann. Rpt., 21 (1933), pp. 132-136*).—Records taken over 3 cropping years on hops planted 3, 6, and 9 ft. between hills in the row showed that the acre yield increases and the hill yield decreases with close planting. The usual commercial spacing of 7 by 6 ft. with two bines per string appeared very satisfactory.

Natural cross-pollination in lettuce, R. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 545-547*).—At Arlington Experiment Farm, Va., a green-leaved variety of lettuce, White Chavigne, was grown alternately with Mignonette, a variety with red-pigmented leaves. Seed taken from the White Chavigne plants were sown and in every case produced a small percentage of pigmented plants, averaging 2.02 percent in 10 progenies in 1932 and 3.04 percent in the same number in 1933. The author points out that the lettuce flower generally remains open for one-half to three-fourths of an hour in early morning, but that on cool, cloudy days it may remain open for several hours. During the delayed period two species of insects (*Halictus* spp.) were observed to visit the blooms.

Further studies relative to fertilizer treatment of lettuce, L. L. CLAYPOOL (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 548, 549*).—Continuing the study (E. S. R., 70, p. 618), the Washington Experiment Station again found that N is the chief limiting factor in the production of New York lettuce on irrigated soils at Prosser. That P was also beneficial was shown in the fact

that the heaviest heads and largest yields of seed in 1933 were produced on the NP plats. The NK plats were little better than N alone. Since the manure plats did not equal the leading commercial fertilizer areas, it is concluded that inorganic fertilizers provide the necessary nutrients for lettuce production.

Influence of temperature and nutrition on the growth and duration of life of *Cucumis melo* seedlings, T. I. EDWARDS, R. PEARL, and S. A. GOULD (*Bot. Gaz.*, 96 (1934), No. 1, pp. 118-135, figs. 5).—Studies at Johns Hopkins University upon muskmelon seedlings grown on plain and nutrient agars in darkness at five constant temperatures ranging from 15° to 35° C. (59° to 95° F.) showed that the optimal temperature for hypocotyl development was 30° and for roots 15° or 20°. The differences between hypocotyl growth on nutrient and on plain agar were greatest at the temperature extremes and least at the optimal. The most rapid growth was associated with short life duration. In the 10 different environments provided, roots and hypocotyls had different degrees of development, and the amount of nonaqueous material lost in respiration during the life of the plants differed also.

Carbon dioxide experiments in frames with melons [trans. title], E. JOHANSSON (*Meddel. Alnarps Trädgårdars Försöksverks. [Sweden]*, No. 35 (1934), pp. 1-12; *Eng. abs.*, pp. 11, 12).—Attempts to increase the carbon dioxide production in frames heated with steam or hot water by the introduction of cut straw resulted in a marked increase during the first 6 weeks. Yields were highest in the cut straw and stable manure beds, and since the other beds were liberally supplied with nutrients the author concludes that carbon dioxide output from the straw bed must have been an effective factor.

Anatomy of the vegetative organs of the parsnip, W. C. WARNING (*Bot. Gaz.*, 96 (1934), No. 1, pp. 44-72, figs. 44).—The results are presented of a cytological study of the structure and structural changes in the Hollow Crown parsnip during its two years of development. It was observed that the greater portion of the root and hypocotyl remain in the parenchymatous state during the first year, and that increment in size results from the enlargement of individual cells.

The influence of planting depth on the shape of the Scarlet Globe radish, J. B. EDMOND (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 554-557).—Measurements at the Mississippi Experiment Station upon two strains of Early Scarlet Globe radish developed from seeds sown at 0.5 and 1.5 in. depth showed in all cases that roots from deep plantings were longer and of lesser width than those from shallow plantings. The two strains differed somewhat in form but not to the extent induced by planting depth. Similar results were secured with another strain in the greenhouse. Since the round, globular type is preferable, shallow planting is obviously the more desirable.

Spinach varieties, E. S. HABER (*Iowa State Hort. Soc. Rpt.*, 68 (1933), pp. 224-230).—Over a 3-yr. period King of Denmark was consistently more productive in tests at the Iowa Experiment Station than any other of 10 spinaches. Anstvorskov proved identical with King of Denmark, and Giant Leaved Noble with Noble Gaudry. In April plantings permitted to flower, Virginia Savoy was the first to develop seedstalks. Ranked in order of seedstalk appearance were (1) Virginia Savoy, (2) Bloomsdale Savoy, (3) Long Standing Bloomsdale and Viroflay, (4) Princess Juliana, Triumph, and Victoria, (5) Giant Leaved Noble and Noble Gaudry, and (6) King of Denmark. Descriptions are presented.

Squash varieties for winter use, W. T. TAPLEY (*Farm Res. [New York State Sta.]*, 1 (1934), No. 1, p. 6).—Among winter squashes discussed as desirable are Boston Marrow, Golden Delicious, Green Delicious, Quality, Banana,

Improved Hubbard, Golden Hubbard, Warty Hubbard, and Blue Hubbard. A temperature of from 50° to 55° F. with dry conditions is suggested as favorable for the storage of winter squash.

Sweet potato propagation as affected by temperature and character of the bedded roots. R. A. MCGINTY and E. R. MILLER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 538-540).—Observations at the Oklahoma Experiment Station on Porto Rico sweetpotato plants grown in electrically heated beds in which the soil was maintained at approximately 75°, 85°, and 95° F. showed a response to heating in number of plants in all three beds, with definite indications that 85° was the most beneficial temperature. At this point the plants were large and stocky while those at 95° were spindling and tender. In the heated beds, plants appeared above ground much sooner and were ready for use many days ahead of the controls. Based on the results in the three heated beds and the check bed, small potatoes yielded a higher average number of plants per pound of bedded potato than did large potatoes. Halving medium-sized potatoes did not increase the number of plants. However, in the greenhouse with soil at 85° halved roots sprouted more quickly and yielded 83 plants as against 59 from whole roots.

The effect of date of planting on the shape of Porto Rico sweet potatoes. J. C. MILLER and W. D. KIMBROUGH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 541-544, fig. 1).—Stating that the Louisiana Experiment Station had been unable to observe any effect of either nitrogen or potassium on the shape of Porto Rico sweetpotatoes, the authors report significant effects of time of planting on shape, the early plants resulting in chunkier, shorter roots. The length-diameter ratios for the crop of U. S. No. 1 roots from early plantings were 1.57 ± 0.014 and 1.33 ± 0.023 in 1932 and 1933, respectively, and for the late-planted crop 2.78 ± 0.024 and 2.23 ± 0.039 . It made no difference whether plants were produced from slips or from vine cuttings.

The effect of varying amounts of potash on grade and yield of the Porto Rico sweetpotato. J. H. BEATTIE, J. D. McCOWN, and E. E. HALL (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 534-537).—At the Pee Dee Substation, Florence, S. C., 500 lb. of 3-8-9 and 3-8-12 fertilizer produced significant increases in total yields of sweetpotatoes above equal quantities of a 3-8-3 mixture. The 3-8-9 treatment was significantly more effective than the 3-8-6. Most of the differences occurred in the oversized or jumbo grade; in fact, in the No. 1 size there were no significant differences in yield, and in the No. 2 grade the only differences were negative. Yield increases obtained with the high-potash fertilizers were not profitable.

Tomato storage: Further observations on the storage of tropically grown tomatoes. C. W. WARDLAW and L. P. MCGUIRE (*Trop. Agr. [Trinidad]*, 10 (1933), No. 6, pp. 161-163).—In this further report (E. S. R., 68, p. 477) the authors, working with Bonny Best tomatoes grown on differentially fertilized plats, found that tomatoes kept well for 17 days at 47.5° F. and did not deteriorate rapidly upon removal. The occurrence of fungus infections prevented drawing any deductions on the effect of fertilizers. *Phoma destructiva* was by far the most important fungus parasite.

The relation of experiment station work to the fruit industry. E. C. JOHNSON (*Wash. State Hort. Assoc. Proc.*, 29 (1933), pp. 21-31).—This is a discussion of the horticultural program of the Washington Experiment Station, citing the more important results obtained during recent years.

An investigation of solvents for the removal of lead arsenate residues from fruits. R. H. CARTER (*Jour. Econ. Ent.*, 27 (1934), No. 4, pp. 848-853).—Among various inorganic acids, hydrochloric proved to be most effective in dissolving both lead and arsenic, which went into solution in the same ratio

that they were present in the lead arsenate. Organic acids were apparently too weak, but were capable of undergoing chemical reaction with lead arsenate, causing precipitation of insoluble lead salts. Certain alkalies, especially sodium silicate and sodium hydroxide, could dissolve appreciable quantities of both lead and arsenic, but weak alkalies, such as ammonium hydroxide and organic amines, had no appreciable action. Wetting agents and degumming soaps had very little solvent power when used alone. Any increased efficiency due to adding these compounds is believed the result of increased wettability rather than solvent power.

Injection of fruit trees: Preliminary experiments with artificial manures, L. A. THOMAS and W. A. ROACH (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 2, pp. 151-166, figs. 3).—At the East Malling Research Station, Beauty of Bath and Cox Orange Pippin apple trees worked on Malling stocks I, V, and XII were injected through holes in the trunk with solutions of various nutrient salts in N/5 and N/10 concentrations in winter and summer, respectively. Injury which followed injection in many cases was found to vary with (1) the scion variety, (2) the rootstock, (3) the material injected, (4) the concentration, and (5) the total amount injected. For example, potassium nitrate and ammonium nitrate caused no injury to either variety on stock XII but did cause serious damage to Beauty of Bath on V. Summer injury, except in the case of ammonium sulfate and ammonium nitrate, was manifested in a scorching of the leaf margin typical of potassium deficiency. Winter injury was generally confined to the bark and buds. It is believed that most of the damage from winter and a certain amount from summer injections could have been avoided by a careful selection of compounds. When equal amounts of nitrogen were used, toxicity decreased in the order potassium nitrate, ammonium nitrate, and urea. With all the nutrient salts tested solutions of 0.25 percent were safe, and sufficient quantities were absorbed in about 24 hr. to bring about growth increases as great as any caused by the heaviest soil applications.

Tree injection: A progress report, W. A. ROACH (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 137-141, figs. 3).—Discussing methods of direct injection of nutrient solutions into the tree, the author reports that injections of potassium nitrate into a large tree actually doubled the new growth and increased the size and vigor of the foliage. Some evidence was seen that the injection of sodium thiosulfate may control attacks of apple mildew.

A method of converting unprofitable fruit trees, R. J. GARNER (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 103-107, pls. 2, figs. 3).—Observing that severe deheading of mature apple trees preparatory to reworking often resulted in disease entrance, the author describes a successful method of whip-and-tongue grafting. An average of 177 grafts were inserted in each tree. Good success was also secured in top-working Laxton Utility plums.

Scion rooting at East Malling Research Station, R. G. HATTON and N. B. BAGENAL (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 243-246, pl. 1).—Citing instances of scion rooting in apples and pears, the authors point out that certain varieties show a special tendency in this direction, and make the practical suggestion that in planting the unions be placed above the soil.

The use of rubber strips in budding fruit trees, R. J. GARNER (*Gard. Chron.*, 3. ser., 94 (1933), No. 2427, pp. 13, 14; also in *East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), p. 263).—Comparisons of rubber strips and raffia for binding the grafts of apple trees showed 92 and 79 percent success for the two materials, respectively.

Winter injury to fruits widespread, R. WELLINGTON (*Farm Res. [New York State Sta.]*, 1 (1934), No. 1, p. 8).—Describing the winter of 1933–34 as the severest since the station was established in 1882, the author discusses the behavior of various raspberries, grapes, peaches, plums, cherries, pears, and apples. Injury to grapes was related directly to their percentage of vinifera parentage. The McIntosh group of apples again demonstrated its hardiness, and the European or domestica type plums fared better than the Japanese. The sour cherries suffered much less injury than did the sweets.

Hardy stocks for fruit trees, H. L. LANTZ (*Iowa State Hort. Soc. Rpt.*, 68 (1933), pp. 17–22).—Observations in an orchard at the Iowa Experiment Station in which Jonathan, Grimes Golden, Willowtwig, and certain other varieties of apples were budded in 1925 on Virginia Crab and Hibernial stocks showed considerable differences in total growth and yield made by the same varieties on the two stocks. The varieties, particularly Delicious and Grimes Golden, topworked on Virginia Crab were consistently more vigorous than when on Hibernial. Summarizing the production data for 1932 and 1933, varieties on Virginia Crab yielded an average of 59.4 lb. per tree as compared with 24.8 lb. for the Hibernial group. Virginia Crab trunks showed a tendency to crack, but with no indication of harmful effects.

Further observations on the parts played by root and stem in stock influence, R. C. KNIGHT (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 114–116, fig. 1).—Records taken on the total shoot growth and blooming performance of Lane Prince Albert trees double-worked in various ways on two rootstocks, one dwarfing and the other vigorous, showed that the root system has more influence on the tree than does the intermediate stem piece. The insertion of an intermediate piece of dwarfing stock resulted in the sixth year in less than half the shoot growth made by trees double-worked on vigorous stocks.

The testing of new varieties of apple rootstock, H. M. TYDEMAN (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 94–99).—Records taken over a 3-yr. period on the vigor, as expressed in shoot growth and diameter increment of the trunk and in quantity and quality of bloom and fruits, of Lane Prince Albert apples on selected seedling rootstocks of two families, namely, Malling No. VIII × Malling No. IX and Northern Spy × Malling No. II, showed striking differences between the two groups and within each group. In the Malling No. VIII × Malling No. IX group the most vigorous trees produced on the average over three times as much wood, both at 2 and 3 yr., as did the weakest trees. In the Northern Spy × Malling No. II group the differences were so limited that the author doubts their significance. In their third year the 90 trees on Northern Spy × Malling No. II roots produced 13.9 blossom clusters and 4 fruits per tree as compared with 56.9 clusters and 6.3 fruits for the other group of 218 trees.

The distribution of growth between roots, stems, and leaves in a young apple tree and its possible bearing on the problem of stock effect on tree vigour, M. C. VYVYAN (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 122–131, figs. 2).—Repeated determinations taken on rooted shoots obtained from stool beds of Malling No. XIII showed that the total annual increment in weight varied in approximately constant proportions between roots, stems, and leaves irrespective of the size and age of the trees. In both roots and shoots the rate of increase in weight attained a maximum in June and July. It is suggested that when a stock and scion are combined to form a tree their respective growth rates are probably adjusted to a common and intermediate value.

Root studies.—IV, A method of observing root growth in the field, illustrated by observations in an irrigated apple orchard in British Columbia, W. S. ROGERS (*East Malling [Kent] Res. Sta. Ann. Rpt., 21 (1933), pp. 86-91, pls. 2, fig. 1*).—Continuing this series (E. S. R., 69, p. 654), a descriptive account is presented of a glass-sided observation trench and equipment by means of which it was possible to make detailed observations on the growth of apple tree roots. Observations at Summerland, B. C., on a 16-year-old McIntosh tree on seedling roots showed that soil temperature and soil moisture have a profound effect on root development. A deficiency of moisture rapidly checked root growth.

Root studies.—V, Rootstock and soil effect on apple root systems, W. S. ROGERS and M. C. VYVYAN (*Jour. Pomol. and Hort. Sci., 12 (1934), No. 2, pp. 110-150, pls. 7, figs. 10*).—Observations at the East Malling Research Station upon the roots of 26 Lane Prince Albert apple trees worked on several different rootstocks, ranging from the very dwarfing No. IX to the very vigorous No. XVI, showed that the scion has a profound influence on the roots. The trees were 10 and 11 yr. of age at the time of digging. The type of soil also had an influence on root spread, penetration, and type. For example, in sand the root spread was 2 to 3 times and in clay 1.5 times that of the branches. In general the trees on dwarfing stocks had deeper roots than those on the more vigorous stocks. On any given stock the roots in sand were shallower than those in clay. In sand the roots were long, thin, and straight, while in clay the roots were short, twisting, and branching. However, in the 10 yr. neither soil nor scion effects were sufficient to change the original stock beyond the point of recognition.

The influence of winter stem pruning on subsequent stem- and root-development in the apple, R. C. KNIGHT (*Jour. Pomol. and Hort. Sci., 12 (1934), No. 1, pp. 1-14*).—In experiments at the East Malling Research Station in which several varieties of apples grafted on different clonal rootstocks were pruned with varying degrees of severity, it was found that subsequent production of new roots was decreased and that of new shoots increased by pruning, unless the treatment was very severe. Pruning apparently diverted a proportion of the nutrients ordinarily devoted to thickening of old stems to the production of new shoots. The ratio of new stem growth to new root growth remained very uniform under all conditions of pruning.

The effect of size of tree on the relations between various records of roots and stems of apples, R. C. KNIGHT and T. N. HOBLYN (*East Malling [Kent] Res. Sta. Ann. Rpt., 21 (1933), pp. 117-121*).—Weights and measurements taken on the stems and roots of a batch of nearly 400 2-year-old Grenadier apple trees grafted on Malling No. VI showed that the percentage of fibrous roots decreases with increasing weight of the root system. The proportion of stem to root was remarkably constant throughout the entire group of trees. The ratio of the weight of scion to cross sectional area of the trunk increased with the total weight of the tree.

Factors affecting small size of individual apples during the 1933 season, E. L. OVERHOLSER, F. L. OVERLEY, and L. L. CLAYPOOL (*Wash. State Hort. Assoc. Proc., 29 (1933), pp. 116-120*).—Records taken on the size of Jonathan apples harvested from different fertilizer plats indicated that fertilizers have a much greater influence on the total crop than on the size of individual fruits. It is concluded that the unusually small fruits in 1933 are not attributable to the lesser amount of fertilizer used by growers but rather to a combination of factors, such as short growing season, low winter temperature, and abnormally high summer temperatures.

A comparative study of the intercellular spaces of apple leaves, W. F. PICKETT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 156-161, figs. 2).—Observations at the Kansas Experiment Station on fully grown leaves of Jonathan, Delicious, Gano, Lowland Raspberry (Liveland), Wealthy, Winesap, and York Imperial collected in August 1932 and June 1933 showed highly significant differences, both in the average cross sectional area and the average perimeter of the intercellular spaces, between certain varieties and no significance between others. The differences between the means of Lowland Raspberry and the other varieties were outstandingly large. Stomatal behavior studied in samples collected several times during July 10, 1933, a clear, bright day, showed the stomata to close shortly after 9 a. m. and stay closed the remainder of the day.

An unusual leaf variation of the apple, A. P. FRENCH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 143-146, figs. 2).—An account is presented of the discovery in a commercial nursery near Rochester, N. Y., of a Red Astrachan tree bearing normal leaves and also leaves so peculiar in form as to scarcely resemble apple. Buddings from the abnormal sections of the tree produced both normal and abnormal trees, suggesting that there was an uneven distribution of the mutating tissues in the original bud stick. The original tree when shipped to the Massachusetts Experiment Station developed all normal foliage.

Influence of the amount of air supplied to apple leaves upon their CO₂ assimilation, E. P. CHRISTOPHER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 435-439, figs. 9).—Using the Heinicke-Hoffman apparatus (E. S. R., 68, p. 744), the author in studies with potted McIntosh and Baldwin trees found that increasing or decreasing the rate of air flow to the leaf had a direct influence on the amount of CO₂ assimilated. Corroborative data were secured on Baldwin trees in the orchard. Rates higher than those observed by other workers with CO₂ enriched air were secured. The author suggests that in work with apple leaves an air flow of from 2 to 2.5 l per square centimeter per hour should be employed to provide a normal CO₂ supply.

Apple manurial trials, T. N. HOBLYN and W. A. BANE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 59-85, pls. 3, figs. 4).—Twelve-year-old Bramley Seedling and Worcester Pearmain apples on different clonal rootstocks and growing under tillage without fertilization were subjected to heavy dressings of sulfate of ammonia and sulfate of potassium. The latter had a remarkable stimulating effect on shoot growth and on quantity and quality of the crop. Nitrogen alone was generally harmful, but when combined with potassium gave further increases in growth and production but decreased color.

Results were somewhat different in an orchard in grass. Here heavy applications of a nitrogen fertilizer, Nitrochalk, increased growth materially but affected unfavorably the color and firmness of the fruits. Moderate applications of Nitrochalk were beneficial.

Fertilizer responses of Baldwin apple trees on an acid soil, R. C. COLLISON and J. D. HARLAN (*New York State Sta. Bul.* 646 (1934), pp. 24).—Studies in a well managed Wayne County Baldwin orchard located on a soil the surface layers of which ranged from pH 4.5 to 5.2, despite an abundance of lime at a depth of from 30 to 36 in., showed the acid nature of the surface soil to have a marked effect on fertilizer responses despite the underlying calcium. Unless provisions were made for correcting their potential acidity, nitrogen materials and combinations in which the nitrogen was entirely or predominantly in ammonia form gave lower yields, a smaller proportion of marketable sizes, and less terminal growth than did trees receiving nitrogen in nitrate form, in organic form, or with some provision for correcting acidity. The lowest total yield of all treatments, 341 bu., over the 4 yr. was produced by

the trees receiving ammonium sulfate alone, and the highest yield, 475 bu., was produced on the potassium nitrate block. Applications of lime to an ammonium sulfate block increased sharply the quantity and quality of the fruit and growth, but since the liming did not meet the lime requirements of the soil the authors assume that the presence of active calcium was an important consideration.

Determinations at the end of 4 yr. showed that ammonium fertilizers had increased acidity in the surface soil and that urea had no influence, whereas nitrates had a moderate and lime and cyanamide a pronounced tendency to correct acidity. The very favorable effect of potassium nitrate is believed associated with a more efficient assimilation of nitrogen by the trees and to some extent the greater assimilation of potassium from this salt.

Winter injury of Baldwin apple trees and its relation to previous tree performance and nutritional treatment, R. C. COLLISON and J. D. HARLAN (*New York State Sta. Bul.* 647 (1934), pp. 13).—Observations in the above orchard in the spring following the severe winter of 1933-34 showed certain very definite correlations between winter injury and preceding fertilizer treatment. There was found a significant tendency for high yields of the preceding season to accompany winter injury, the coefficient of correlation, as determined from computations of data recorded May 18, being 0.277 ± 0.047 . However, on the basis of 4 years' yields, fertilizers containing nitrogen in nitrate form and those which supplied available lime increased resistance against winter injury despite their marked stimulating effect on growth and yields. On the low-lime soil characterizing this particular orchard, those treatments which gave larger yields and better growth were the ones which best fortified the trees against low temperature despite the fact that high yields of the preceding year had a definite tendency to increase winter injury.

Spring and mid-summer applications of nitrogen in the apple orchard, G. F. POTTER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 164-168; also *New Hampshire Sta. Sci. Contrib.* 42 [1933], pp. 164-168).—Working with paired trees of Baldwin, Rhode Island Greening, and McIntosh located in a commercial orchard at Temple, the New Hampshire Experiment Station failed to find over a period of several years in any instance adequate evidence that dividing the application of nitrogen into two parts had significantly altered the growth or functioning of the trees as measured in average annual yield, average size of apples, average percentage of color, percentage of spurs forming blossom buds, percentage of blossoming spurs setting fruit, average annual twig growth, and increment in trunk diameter. Apparently where the level of nitrogen metabolism was maintained satisfactorily, it made no difference whether the supply was replenished once or twice a year.

The apple variety question is acute, R. WELLINGTON (*Farm Res.* [*New York State Sta.*], 1 (1934), No. 1, pp. 1, 2).—Pointing out the continuous progressive change in apple varieties, the author comments on the valuable qualities of certain new apples, such as Macoun, Kendall, Milton, Van Buren, Red Duchess, Red Gravenstein, Red Spy, and Red Delicious.

A sweet Jonathan bud "sport", L. R. TUCKER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 154, 155).—A single tree occurring in a lot of 70-odd Jonathans growing near Fruitland, Idaho, was found by the Idaho Experiment Station to bear fruits identical with Jonathan in every respect except acidity, which was even less than in the Delicious. The vegetative characters were apparently identical with Jonathan. The name "Sweet Jonathan" is suggested for this apparent sport.

Pollination studies with the apple [trans. title], G. CALLMAR and E. JOHANSSON (*Sveriges Pomol. För. Årsskr.*, 35 (1934), No. 3, pp. 169-196).—Briefly reviewing investigations in England, Germany, Denmark, the United States, and Sweden, the authors discuss recent results obtained in orchards near Stockholm.

The relation of weather to pollination of the McIntosh apple, R. L. BOYD and L. P. LATIMER (*New Hampshire Sta. Sci. Contrib.* 43 [1933], pp. 12-16, fig. 1).—This paper was abstracted from its original source (*E. S. R.*, 72, p. 186).

A two-year study of labor and equipment used in spraying forty-two New Hampshire orchards, E. J. RASMUSSEN (*New Hampshire Sta. Sci. Contrib.* 44 [1933], pp. 1-3).—The material herein was previously noted (*E. S. R.*, 72, p. 187).

Chemical studies in the physiology of apples.—XIV, **A method of estimating chemical change and rate of respiration in stored apples**, G. LALL (*Ann. Bot. [London]*, 48 (1934), No. 189, pp. 273-292, figs. 3).—Continuing these studies (*E. S. R.*, 68, p. 333), the use at the Imperial College of Science and Technology of the half fruit method of determining respiration losses and chemical changes in apples showed that the difference in composition of corresponding halves is somewhat less than between separate fruits. The variation in respiratory activity of the paired halves was very small. Cutting stimulated the rate of respiration during the first few days at 12° C. so that records were not taken on carbon dioxide output until from 10 to 14 days after cutting. Differences were observed in the metabolism of the Worcester Pearmain and the Bramley Seedling varieties. Apparently in the former the sugar underwent a more or less complete oxidation to carbon dioxide, while in the latter it was apparent that certain volatile products other than carbon dioxide must have resulted from sugar oxidation. The author suggests that the type of respiration observed in the Bramley Seedling may be associated with its heavy waxy coat.

Handling of Jonathan apples for storage, F. GERHARDT and B. D. EZELL (*Wash. State Hort. Assoc. Proc.*, 29 (1933), pp. 100-103, fig. 1).—Studies by the U. S. Department of Agriculture at Wenatchee, Wash., showed the importance of carefully timed picking of the Jonathan apple. Fruit left on the trees to secure increased color and size developed excessive amounts of soft scald when stored at 32° F. Prompt storage after picking proved an important factor in reducing scald losses. Storage at 36° produced notably less soft scald than at 32°, and internal breakdown was less than 1 percent at both temperatures.

Getting fruit to consumers in better condition, E. SMITH (*Wash. State Hort. Assoc. Proc.*, 29 (1933), pp. 105-109).—Incident to a discussion of the effects of different washes on the keeping of stored fruits and on the protection of fruits during transportation to market, the author points out that Starking and Richared may be picked from 4 to 6 days earlier than Delicious but warns that too early picking simply on the basis of color results in tough, astringent apples which will undoubtedly destroy the market for these new varieties. The pressure test was not found a completely reliable index to maturity in the Delicious apple.

Refrigerated transportation of Bartlett pears from the Pacific Northwest, E. D. MALLISON and C. L. POWELL (*U. S. Dept. Agr., Tech. Bul.* 434 (1934), pp. 30, figs. 10).—Based on 4 years' work involving five complete transportation tests from Medford, Oreg., or Yakima, Wash., to New York City, mostly during August and September, it was found that precooling pears prior

to loading in refrigerator cars made possible a material increase in the number of boxes of fruit that could be placed in a car without increasing the transit temperature or accelerating the rate of ripening. Precooled pears shipped in 720-box loads arrived at the market in a firm condition and were as suitable for storage as those shipped in 520-box loads. The heavier loading made possible a material saving to both shippers and carriers.

In precooled shipments the placing of 75 or 50 lb. of salt on the ice at each icing station produced lower and more uniform temperatures and was more effective in retarding ripening than was the application of 3 percent of salt. It was found desirable in precooled shipments to place the boxes closely with an air space between the fruit and the side of the car. In conclusion it is emphasized that Bartlett pears from the Pacific Northwest when picked at the right stage can be shipped at an average temperature as high as 41° to 43° F. for the 10- or 12-day trip and remain in good marketable condition after 2 mo. of subsequent storage at 32°. If intended for immediate consumption, the transportation temperature may be as high as 50°.

Xenia and metaxenia in the Bartlett pear, W. P. TUFTS and C. J. HANSEN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 134-139, fig. 1).—Cross-pollination studies conducted by the California Experiment Station in two orchards in Santa Clara County showed that the pollen parent influenced the shape of the fruit, but examination of the seeds suggested that this variation may be due to the ability of certain pollens to fertilize embryos rather than to metaxenia. There appeared to be a negative correlation between the length-diameter ratio and the number of seeds. Pollen of long-fruited varieties, such as Beurre Bosc and P. Barry, did not produce longer Bartlett pears than did that of short-fruited varieties, such as Anjou. With one exception, diameter increased with the number of seeds, whereas length, with one exception, was not influenced. The conclusion is reached that if metaxenia of form existed in the Bartlett crosses it was hidden by the seed effects. Some evidence was found of the influence of pollen on the shape of the seed.

The influence of branch pruning of cherries on the growth of suckers, N. H. GRUBB and R. C. KNIGHT (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 92, 93).—Severe dehorning of previously moderately pruned Morello cherries growing on vegetatively propagated rootstocks resulted in an increase approximating 100 percent in root suckers.

An unfruitful sport of the Shadow Amarelle cherry [trans. title], K. KROEMER and H. SCHANDERL (*Landw. Jahrb.*, 79 (1934), *Sup.*, pp. 177, 178).—Of two strains of Shadow Amarelle cherries, one with round and the other with acute buds and growing in the experimental orchards at Geisenheim, the acute-budded strain failed to set fruit. Pollination studies showed this strain to be almost completely self-unfruitful, although the round-budded strain was fully self-fruitful. Black Tartarian, Ostheim, and Dönissen Yellow proved satisfactory pollinizers. The self-fruitful strain failed to fertilize the self-unfruitful, whereas the reciprocal cross was highly successful.

Orchard trials of nitrogen and phosphorus, E. L. PROEBSTING and C. F. KINMAN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 426-430, fig. 1).—Fertility studies carried on near San Jose, Calif., with mature apricot, prune, and peach trees growing in a very deep gravelly loam failed to show any effect of nitrogen or phosphorus or both on yield or increment in trunk girth. Nitrogen did increase the amount of shoot growth, abundance of foliage, and color of leaves, and delayed leaf abscission and the time of ripening. The placing of fertilizer at the bottom of furrows failed to increase the assimilation of phosphorus as measured in leaf analyses, despite a marked proliferation of roots

in the fertilized area. Placement had no noticeable influence on growth or yield.

In the leaf analyses the variations of phosphorus and nitrogen in any single treatment were large, reaching maxima of 25 and 15 percent of the means, respectively, and apparently masking small differences attributable to treatment. However, an interrelation of phosphorus and potassium was evident, since the nitrogen content of leaves was highest and the phosphorus content lowest in the trees receiving ammonium sulfate. The phosphorus-nitrogen ratio was lower in every case where nitrogen was applied, whether phosphorus was or was not used.

The germination of "non-viable" peach seeds, O. W. DAVIDSON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 129-132).—Earlier studies by Connors (E. S. R., 57, p. 737) having shown that the seeds of peaches ripening before Carman were either nonviable or possessed very low viability, peach seeds of several varieties collected in the orchards of the New Jersey Experiment Stations from July 7 to August 30 were placed in sand and in agar cultures in an attempt to secure germination. None of the various agar nutrients was satisfactory because the germinating seedlings rarely produced roots. Good results were secured in sand cultures, the seeds germinating in from 14 to 21 days. Light appeared necessary for the development of abortive peach embryos, apparently supplying through photosynthesis the necessary carbohydrates. A temperature range of from 20° to 30° C. was favorable. A tabulation of results shows 5 peaches, Greensboro, Mayflower, Early Wheeler, No. 168425, and No. 172425, which failed to germinate. Although afterripening apparently was not essential to the germination of mature, viable peach embryos, such treatment appeared necessary for normal growth of seedlings. All peach seedlings developed in 1933 in artificial cultures were abnormal, with unusually small, wrinkled leaves and dwarfed growth. On October 20, when top growth ceased, the largest seedlings were not more than 4 in. tall.

The mode of duplication of petals in the double flowers of *Prunus mume*, Y. IMAI (*Jour. Col. Agr., Imp. Univ. Tokyo*, 12 (1934), No. 3, pp. 387-408, pl. 1, figs. 5).—The nature of doubling in the flower of *P. mume* is discussed, with special reference to the mode of duplication of the petals. Petalomania occurs in definite schemes with different degrees of primary, secondary, and tertiary duplications with imperfect stages.

Plum rootstocks: A note on some root-systems, E. G. ING (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 108-110, pls. 3).—Brief descriptive notes are presented on the nature and growth habits of several vegetative and sexually propagated rootstocks.

A complex experiment in the propagation of plum rootstocks from root cuttings, season 1931-1932, T. N. HOBLYN and R. C. PALMER (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 1, pp. 36-56, pls. 2, figs. 2).—Utilizing two varieties, Common Mussel, which roots readily from cuttings, and Pershore Egg, which propagates with difficulty, records were taken at the East Malling Research Station on various factors, such as size of cutting, time of planting, etc., that might be concerned with rooting. Since only a few random cuttings of Pershore Egg rooted and these were not connected with any one treatment, results with this variety were omitted. In the rather mild winter there was little difference in survival or growth of cuttings made and planted in October, December, January, and February. Cuttings taken and planted in April showed lower survival and made very poor growth. Bedding of cuttings in sand until spring proved actually detrimental. Size of cuttings was a material factor in

survival. Within the limits of the lengths employed, 12 cm was more successful than shorter lengths. Diameter appeared to be less important than length.

New varieties of rootstock for plums: A preliminary report on trials with seedlings of *Prunus divaricata*, H. M. TYDEMAN (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 100-102).—Observations on Czar plum trees budded on a batch of 150 seedlings comprising 29 families of *P. divaricata* obtained from western Asia showed none of the families to be completely incompatible with Czar. There was, however, a wide range of variation in the length of shoots on the various families, the most vigorous having shoots averaging approximately 2.5 times as long as those produced by the least vigorous family. Lateral shoot development also varied sharply.

The maintenance of predetermined soil-moisture conditions in irrigation experiments, A. H. HENDRICKSON and F. J. VEIHMEYER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 421-425, figs. 2).—Asserting that soil moisture is equally available to plants at all moisture contents from field capacity to about the permanent wilting percentage, the authors present data obtained by the California Experiment Station in a mature prune orchard at Davis. The records show that the rates of extraction of water from differentially irrigated plats proceeded at uniform rates until the wilting point of the lesser irrigated plat was approached. There was a slow extraction of water after the permanent wilting percentage was reached. Because of this uniform rate of water utilization by the trees it is possible to forecast fairly accurately the date of available water exhaustion. The authors conclude that under conditions such as exist at Davis decisive differences in experimental treatments are needed to secure significant differences in response of deciduous fruits to irrigation. Certain of the difficulties in irrigation studies, such as taking of samples in a variable soil, nonuniform wetting, and in the case of young trees incomplete distribution of roots, are discussed.

Plant spacing, a major factor in the local adaptation of strawberry varieties, G. M. DARROW (*Science*, 80 (1934), No. 2075, p. 315).—Records taken by the U. S. Department of Agriculture at Willard, N. C., on Blakemore strawberry plants spaced 30, 4, 1½, and ⅔ plants per square foot showed yields of 42-, 119-, 131-, and 99-bu. crates of marketable fruit per acre. Adding these records to observations on Dorsett, Fairfax, and other varieties, the author concludes that the number of plants per given area is an important factor in determining the adaptation of varieties.

Reaction of the nutrient medium as affecting growth of strawberry plants, J. H. CLARK (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 283-287).—At the New Jersey Experiment Stations runner plants of Howard 17 removed from the field on October 4 and placed in white quartz sand were supplied with constant drip nutrient solutions of reaction levels maintained by the addition of sulfuric acid or potassium hydroxide. Sufficient quantities of the solutions were passed through the pots to prevent large fluctuations of pH due to differential absorption. Observations after 41 days showed the greatest total growth in the calcium nitrate series at pH 4.6 and in the ammonium sulfate series at pH 6.4.

Raspberry and blackberry cane measurements, G. M. DARROW and G. F. WALDO (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 269-274, fig. 1).—Measurements in two Cuthbert plantations near Tacoma, Wash., in which wide differences in acre yields had been recorded, showed that in the more productive field the canes were longer, had greater basal diameters, fewer buds on the part of the cane left after pruning, and less taper in the first 5.5 ft. Measurements the next year in the productive plantation showed more canes with smaller diameter

than were present the first season. Records taken in 1933 on 25 canes of each of 6 varieties of red raspberries at Corvallis, Oreg., showed more buds and fruiting laterals on the basal 4 ft. of less vigorous canes. Four of the six varieties produced more berries on the larger canes with fewer buds and laterals.

Observations on blackberry and dewberry canes in well managed plantations in western Oregon showed many more buds per cane and per foot of cane on mature plants of Logan and Young than of Himalaya, Evergreen, Dellsweet, and Thornless Evergreen varieties, with fewer and thicker canes. The time of rapid increase in length and diameter differed with varieties. There was noted a strong correlation between diameter of individual canes in May and in November. Summing up, the number of strong canes per plant, cane diameter and length, buds and laterals per foot, and berries per lateral were indicative of vigor and productive capacity.

A rapid method of propagating raspberries and blackberries by leaf-bud cuttings, V. T. STOUTEMYER, T. J. MANEY, and B. S. PICKETT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 278-282, figs. 3).—Leaf cuttings of black raspberry with an axillary bud at the base of the petiole and a small heel of bark and wood attached rooted 100 percent when taken in late July and placed in sand or sand plus peat in heated frames. Repeated trials with leaf-bud cuttings of Chief and Latham red raspberries were unsuccessful despite abundant callusing. Some success was secured with blackberry cuttings in a peat and sand mixture.

Preliminary studies in the fertilization of red raspberries, A. E. STENE (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 275-277).—Utilizing a recently cleared piece of land, the Rhode Island Experiment Station again found (E. S. R., 66, p. 231) that red raspberries respond markedly to potash fertilizers. Rating complete fertilizer yields as 100, the yields of the check, no potash, no nitrogen, and no phosphorus plots were, respectively, 37, 53, 69, and 84. There was surprisingly little difference in yields obtained with 500, 1,000, and 1,500 lb. per acre, being in the case of the complete fertilizer series 32.4 ± 2.7 , 35.6 ± 3.5 , and 33.3 ± 2.9 . In the minus-potassium plots the respective yields were 19.9 ± 1.7 , 17.4 ± 1.7 , and 16.7 ± 1.5 .

A note on the training of loganberries and blackberries, A. B. BEAK-BANE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 21 (1933), pp. 247-249, figs. 4).—Various methods are described and the suggestion made that the cane spot disease (*Plectodiscella veneta*) of loganberries may be checked by training the young canes away from or above the fruiting canes.

Primordial development of the inflorescence of the Concord grape, J. C. SNYDER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 247-252, figs. 2).—Based on cytological studies at the Iowa Experiment Station, a descriptive account is presented of that part of the development of the inflorescence of the Concord grape occurring before the androecium and gynoecium undergo specialization. Flattening of the floral axes in cluster 1 at the time of the spring enlargement of tertiary clusters in the first cluster and of secondary clusters in clusters 2 and 3 was the first evidence of flower bud formation. The initiation of definite floral structures immediately followed the flattening of the floral axis.

Scion influence in citrus, F. F. HALMA (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 2, pp. 99-104, pls. 5).—At the Citrus Experiment Station, Riverside, Calif., Eureka lemons grafted on twigs or piece roots of sour orange influenced the inherent form of the sour orange root system and modified the color reaction of the root-bark extract and the external color of the roots. In the reciprocal grafts the effect of the sour orange scion was limited chiefly to a modification of the external root color. Since similar phenomena were not observed in budded

trees, the author suggests that the method of propagation is involved in the results.

Relation of foliage to fruit size in the Marsh grapefruit, A. D. SHAMEL and C. S. POMEROY (*Calif. Citrogr.*, 19 (1934), No. 11, pp. 296, 329, fig. 1).—Adjustment of the leaves per fruit on ringed branches of vigorous, productive grapefruit trees growing on the Corona ranch in southern California to 25, 40, 50, 60, 75, and 90 leaves per fruit, respectively, indicated that 60 or 75 leaves are needed to produce fruit comparable in size to that developed on untreated limbs. With 90 leaves the fruits were notably larger than the usual tree run, packing out approximately 54 per box as compared with 96 for the 60- and 75-leaf groups. Apparently a thrifty grapefruit tree, such as included in the test, bears sufficient foliage to produce marketable fruits.

Variation in the fruits of Washington Navel oranges with reference to the standardization of quality by means of the sugar/acid ratio, P. R. v. D. R. COPEMAN (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 2, pp. 81-98, figs. 4).—Statistical studies at the Government laboratory Johannesburg, Union of South Africa, upon the results of analyses of Washington Navel oranges showed that the experimental errors of a single determination of the sugar or acid content were ± 0.3 to ± 0.4 percent of the reading. The probable error of a single determination of soluble solids was ± 0.1 percent. The relationship between sugars and soluble solids in the juice was linear over a wide range, indicating that soluble solids may be used as a measure of the sugar content of the juice. Since acidity is closely related to flavor, acid content determinations are suggested as an index to quality. The maximum limit of acidity for export fruit is set at 2 percent.

Investigations on the storage of mangoes, B. N. BANERJEE, D. V. KAR-MARKAR, and G. R. ROW (*Agr. and Livestock in India*, 4 (1934), No. 1, pp. 36-53).—At the Indian Institute of Science, Bangalore, mature mango fruits as harvested contained 0.58 percent protein, 2.1 percent reducing sugar as glucose, 3.1 percent total sugar, and 15.5 percent total carbohydrates. At 0° C. mature, unblemished mangoes kept for from 3 to 5 weeks in satisfactory condition. The critical temperature below which mangoes would not ripen was about 5°. Whole fruit and sliced pulp when preserved in sirup kept satisfactorily for from 3 to 4 mo., beyond which time the pulp became very soft. The addition of a little vinegar, tartaric acid, or citric acid aided preservation.

Embryogeny of *Carya* and *Juglans*, a comparative study, L. M. LANGDON (*Bot. Gaz.*, 96 (1934), No. 1, pp. 93-117, pl. 1, figs. 56).—Based on approximately 350 fixations of material collected at frequent intervals from April to August, a picture is presented of the development of the reproductive tissues and the processes of pollination and fertilization in *Hicoria glabra* and *J. mandshurica*.

After-ripening and germination of *Cotoneaster* seeds, J. GIERSBACH (*Contrib. Boyce Thompson Inst.*, 6 (1934), No. 3, pp. 323-338, figs. 2).—At the Boyce Thompson Institute, seeds of *C. dielsiana* and *C. zabeli* gave nearly 100 percent germination after 4 months' storage in granulated peat held at 10° C. (50° F.), whereas seeds of *C. acutifolia*, *C. apiculata*, *C. horizontalis*, and *C. lucida* germinated poorly even after 10 mo. However, when seeds of the last four species were held in the coldframe for two winters they gave excellent germination the second spring. The author concludes that dormancy in the *Cotoneaster* is the result of two factors, (1) an impervious seed coat, and (2) the need of afterripening after the seed coat is penetrated. The coat effect was removed by treatment with acid or by mechanically removing the seed coat.

Studies of the effects of cheese cloth enclosures on the flower production, underground development, and rate of transpiration of flower crops, F. S. BATSON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 580-582).—In Mississippi a cover of yellow cheesecloth 22 mesh to the inch raised the relative humidity 5 to 8 percent from noon to 5 p. m. on clear days and the temperature as much as 3° F. Stem length of gladiolus, snapdragons, asters, and dahlias was consistently increased under cloth. Gladiolus produced slightly less and snapdragons slightly more florets per spike under cloth, and the average diameter of asters and dahlias was slightly greater. The number of dahlia blooms was greatly decreased. Disease losses with asters and snapdragons were less under the cloth. Transpiration studies with *Clerodendron thomsonae* growing in moisture-sealed pots showed materially less loss under cloth than in the open.

Nutritional studies with chrysanthemums, H. HILL, M. B. DAVIS, and F. B. JOHNSON (*Sci. Agr.*, 15 (1934), No. 2, pp. 110-125, pl. 1, figs. 5; *Fr. abs.*, p. 125).—Chrysanthemums grown at the Central Experimental Farm, Ottawa, Canada, in pots of ground sandstone supplied with various nutrient solutions were found to respond markedly to differential treatments, both externally and in chemical composition. K proved an important nutrient, an N-K ratio of 1:2 producing fine, vigorous plants. Lack of K was evidenced in weak, spindling plants with leaves reduced in size and showing burning from the base two-thirds up the stem. A lack of P was shown in greatly reduced vigor, stunting, and reddening of the leaves. Bloom color was intensified as the concentration of K was increased, and the decreasing effects of N on color were offset by increasing the K. A deficient supply of P tended to increase the depth of color. Increased N supply did not increase the nitrate nitrogen in the leaves but was reflected in the stems. Heavy K feeding was reflected by high K in the stems. In general there was a negative correlation of the N-K ratio on the accumulation of K, Ca, Mg, and P in the plant ash and an antagonism between K and P. There was some indication of moderate varietal differences in response to the same treatment. Comparable results were secured with plants grown in river sand and supplied the same nutrient.

Gladiolus forcing: Effects of exposure to high temperatures before planting, E. C. VOLZ and C. G. KEYES (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 583, 584).—At the Iowa Experiment Station a total of 40 varieties of gladiolus corms were exposed for 2 weeks to a temperature of 86° F. The high temperature lot developed their first vegetative shoots 12 days after planting on February 1, as compared with 25 days for the control corms, which were held at 50° preceding planting. The heat-treated corms bloomed on the average 8 days in advance of the control, with certain varieties exhibiting much greater differences. There was no apparent difference in quality of blossoms from the two lots. In both lots the period from planting to bloom was much shorter in summer than in the early spring.

Care and pruning of ornamental shrubs (*Alabama Sta. Leaflet 12* (1934), pp. 4).—General information is presented on cultural care and pruning.

FORESTRY

Forest tree breeding, C. S. LARSEN (*K. Vet. og Landbohøjskole [Denmark], Aarsskr.*, 1934, pp. 93-113, figs. 10).—Briefly discussing the status of tree breeding in various countries, the author outlines the methods of technic employed at the Royal Veterinary and Agricultural College, Denmark. In self-pollinations entire trees of larch were covered with cloth tents. The author suggests that promising parental trees be increased in number by vegetative propagation.

The importance of the origin of forest seeds, H. I. BALDWIN (*Empire Forestry Jour.* [London], 12 (1933), No. 2, pp. 198-210).—A brief review is given of European and American investigations on the subject, supplemented by a comprehensive bibliography of over 80 titles.

Leader, needle, cambial, and root growth of certain conifers and their interrelations, R. KIENHOLZ (*Bot. Gaz.*, 96 (1934), No. 1, pp. 73-92, figs. 5).—Observations at Keene, N. H., during 1931 on the seasonal course of leader elongation, needle elongation, and cambial growth of red, white, and pitch pines, white spruce, and balsam fir showed conspicuous species differences. In red pine leader elongation began in late April and continued approximately 105 days. From June 13 to June 29, 60 percent of the elongation occurred during the night with a correlation of $+0.744 \pm 0.075$ between night growth and minimum temperature. Needle elongation in red pine began about May 15 and continued for 110 days. Cambial growth began in early May and continued for 150 days. In white pine leader elongation started later than in red but attained the maximum at the same date, June 10. In all the conifers studied there was noted a surge of growth in leaders, roots, and cambium in early June, apparently at the expense of reserve foods. After the reserves were exhausted, subsequent development apparently depended on the elaborated foods, water, and possibly mineral nutrients.

Distribution of moisture in pines, R. A. ST. GEORGE and B. J. HUCKENPAHLER (*Jour. Forestry*, 32 (1934), No. 8, p. 885).—At the Appalachian Forest Experiment Station, Asheville, N. C., the moisture content of the wood of healthy shortleaf pines was found to be lowest at the base and highest at the top of the tree, increasing in nearly a straight-line correlation from 78 percent at the base to 184 percent (oven-dry basis) at the top. Moisture content was higher in spring and summer than in fall and winter.

Some effects of three annual fires on growth of longleaf pine, A. L. MACKINNEY (*Jour. Forestry*, 32 (1934), No. 8, pp. 879-881).—Measurements taken by the Appalachian Forest Experiment Station in three groups of plats in a second-growth longleaf pine stand of an average age of 31 yr. showed that in every density class where comparisons could be made the mean basal area growth (inside bark) was materially less per tree where annual burning had occurred, the reduction ranging from 36 to 75 percent of the growth on the unburned plats. The reduction in height growth was usually greater in small than in large trees, both in actual values and in percentages.

The rate of growth of the ponderosa pine in Estes Park, Colorado, O. E. SPERRY (*Bul. Torrey Bot. Club*, 61 (1934), No. 1, pp. 19-34, figs. 4).—Ponderosa pine, found in an altitude range of from 5,200 to 9,700 ft., thrived best between 6,000 and 8,500 ft. and on the exposed south slopes. Growth rate was directly proportional to the available water supply. The form of the trees was modified by the density of the stand, the available light, and the angle of the slope. The rate of growth was most rapid during the first century of the tree's existence. When the rate of growth of a single tree slowed down materially, the summer wood became less distinct as compared with spring wood.

Clean cutting of ponderosa pine versus selective cutting, I. V. ANDERSON (*Jour. Forestry*, 32 (1934), No. 8, p. 886).—Studies at the Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mont., showed that selective cutting which rejects small diameter trees and large trees with defects results in a higher net return per acre. With selective logging a net return of \$40.72 per acre was produced for a production cost of \$195 as compared with \$30.17 for clean cutting at a production cost of \$365 per acre.

Growth, specific gravity, and shrinkage of twelve Delta hardwoods. B. H. PAUL and R. O. MARTS (*Jour. Forestry*, 32 (1934), No. 8, pp. 861-873, figs. 8).—Data taken in southern Mississippi and in Louisiana on 12 different species of hardwoods showed that the various oaks growing in areas not deeply flooded by backwater or growing on adjacent bluffs maintained a fairly rapid growth rate and produced wood which, with few exceptions, did not vary greatly in specific gravity. The heavier oak wood was found in young second-growth trees of rapid development located on bluffs and on Delta areas not flooded annually. Cedar elm, a rather slow-growing species, was less affected by flooding than most of the lowland trees, but tupelo gum was found the best species next to cypress for almost permanently wet situations. In the periodically flooded areas the wood at the base of ash, tupelo gum, hickory, and persimmon trees was lighter than higher up the tree, and at any given height differences in specific gravity could be traced to differences in growth rate.

What is the relationship between durability and specific gravity of wood? S. BUCKMAN (*Jour. Forestry*, 32 (1934), No. 7, pp. 725-728, figs. 2).—Analyses of data on the resistance of the woods of longleaf, shortleaf, and loblolly pines to the fungus *Lenzites sepiaria* are said to indicate that in the shortleaf and longleaf species heartwoods with high specific gravity are less durable than those of lower specific gravity.

The climbing method for taking tree measurements in plantations of the Central States. L. F. KELLOGG (*Jour. Forestry*, 32 (1934), No. 7, pp. 704-708, figs. 2).—A description is offered of a new technic for the study of standing trees. This is said to provide for greater safety for the climber and a minimum injury to the tree.

The Naval Stores Station of the Bureau of Chemistry and Soils. F. P. VEITCH (*U. S. Dept. Agr., Misc. Pub.* 206 (1934), pp. 11, figs. 10).—A brief account is presented of the new experimental station recently established in the Osceola National Forest about 12 miles east of Lake City, Fla. In addition to describing the buildings and equipment, the purpose and proposed experimental program are discussed.

DISEASES OF PLANTS

[Papers presented at the annual meeting of the southern division of the American Phytopathological Society, Memphis, Tenn., January 31 to February 2, 1934] (*Phytopathology*, 24 (1934), No. 7, pp. 836-844).—The following papers are abstracted: Studies on Potato-Scab Control, by J. J. Taubenhaus (p. 836); Studies on Nailhead Spot of Tomatoes, by G. F. Weber (p. 836); Studies on the Control of the Seedling Blight of Rice in Arkansas, by E. M. Cralley (p. 836); Treatment of Sweet-Potato Plants for the Control of Black Rot, by L. E. Miles (pp. 836, 837); Preliminary Report on an Anthracnose of Lima Bean, by T. D. Persons (p. 837); A Report on the Use of Creosote Oil to Control San Jose Scale and Peach Leaf Curl, by W. W. Stanley, S. Marcovitch, and J. O. Andes (pp. 837, 838); Recent Investigations of Cotton Root Rot in Texas, by D. C. Neal (p. 838); Reversible Vegetative Dissociation of Strains of *Phymatotrichum omnivorum*, by W. N. Ezekiel and J. J. Taubenhaus (p. 839); Insects as Possible Distributing Agents of Cotton Root Rot Caused by *Phymatotrichum omnivorum*, by J. J. Taubenhaus and L. D. Christenson (p. 839); Further Studies on the Toxic Principles that Determine Immunity of Monocotyledonous Plants from *Phymatotrichum* Root Rot, by W. N. Ezekiel, J. J. Taubenhaus, and J. F. Fudge (p. 839); Insects as Possible Distributing

Agents of Cotton Wilt Caused by *Fusarium vasinfectum*, by J. J. Taubenhause and L. D. Christenson (pp. 839, 840); Studies on the *Fusarium* Wilt of Cotton, by V. H. Young and J. O. Ware (p. 840); Seed-Treatment Studies with Fungicidal Dusts at the Arkansas Experiment Station, by V. H. Young (pp. 840, 841); Observations on the Control of Black Rot of Grapes, by V. H. Young (pp. 841, 842); Control of Fire Blight, by H. R. Rosen (p. 842); High Points in Apple Spraying in Tennessee, by J. O. Andes (p. 842); Control Measures for Rosette of Blackberries and Dewberries in Louisiana, by A. G. Plakidas (pp. 842, 843); *Stilbum* on Fig in Louisiana, by E. C. Tims (p. 843); New or Unusual Diseases Reported or Observed in Mississippi in Recent Years, by T. D. Persons (p. 843); *Sorosphaera veronicae* (Schr.) on Corn or Wall Speedwell, *Veronica arvensis*, by L. Donald (pp. 843, 844); and *Verticillium* Wilt of Cotton in Greece, by L. E. Miles (p. 844).

The Plant Disease Reporter, October 15, 1934 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 18 (1934), No. 13, pp. 159-167, fig. 1).—Among other items of current interest, this number contains an article on a method of estimating the percentage of infection of apple leaves by rust, with observations on the relative susceptibility of species and varieties of *Malus* and *Juniperus*, by P. R. Miller; weather and disease in Massachusetts, by O. C. Boyd; weather as a factor contributing to some unusual plant disease losses in Tennessee in 1934, by Miller; and Dutch elm disease in Indiana (reporting the discovery of four trees affected in Indianapolis), by R. K. Beattie.

Diseases of field crops in Arizona, J. G. BROWN and R. B. STREETS (*Arizona Sta. Bul.* 148 (1934), pp. 85-228, figs. 59).—This presents first a compact key to the diseases most prevalent in Arizona on alfalfa, barley, broomcorn, corn (maize), cotton, flax, Johnson grass, oats, peas, red clover, rye, sesame, Sesbania, sorghums, soybean, Sudan grass, wheat, and white sweetclover. This key briefly describes the symptoms of each disease, names the causal agent, and gives a brief résumé of recommended control practices. The second section is devoted to more detailed descriptions of these diseases, followed by more complete discussion of preventive measures. Footnote references are given to pertinent literature. Well selected illustrations, often enlarged, aid the grower in recognizing and understanding the diseases.

Seed treatment methods and soil disinfection are presented in the third section. There is a comprehensive index.

[Plant disease studies in Florida] (*Florida Sta. Rpt.* 1933, pp. 76, 110-126, 134, 135, 137-141, 149, 150, 173-177, 181-183, 190, 191, 194-196).—Brief reports are given of investigational work on the following subjects: Cyanamide as a means of controlling nematodes and susceptibility of *croton* to nematodes, by J. R. Watson; gumming of citrus or psorosis, by A. S. Rhoads; downy mildew of cucurbits and nail head spot of tomatoes, both by G. F. Weber; diseases of strawberries, including *Diplodia* on the roots, by A. N. Brooks and R. E. Nolen; diseases of potatoes, including stem rot and late blight, and brown rot disease (*Bacterium solanacearum*) of potatoes and related plants, both by A. H. Ed-dins; a disease of corn caused by *Physoderma zea maydis*, and seedling, stalk, and ear rot diseases of corn caused by *Diplodia* spp. and by *Fusarium* spp., all by R. K. Voorhees; diseases of gladiolus, narcissus, and Easter lily, by W. B. Shippy; *Fusarium* wilt of watermelons and gummy stem blight (*Mycosphaerella citrullina*), anthracnose, and mosaic disease of watermelon, all by M. N. Walker; blight or "rust" of *Asparagus plumosus*, by Shippy; control of tomato wilt, by Weber and D. G. A. Kelbert; mushroom root rot (*Clitocybe tabescens*) of citrus trees and other woody plants in Florida, by Rhoads; control of black spot (*Phoma destructiva*) of tomatoes in Florida and in transit, by W. B. Tisdale

and S. Hawkins; strawberry wilt or crown rot, by Brooks; decays of citrus fruits in storage (*D. natalensis* and *Alternaria citri*), by Tisdale and E. West; spraying requirements for grapes in Florida, by K. W. Loucks; a trunk-girdling disease (*Diplodia* and another fungus) of lime trees, by Tisdale and Hawkins; occurrence and pathogenicity of *Nematospora* spp. in Florida and stem canker (*Crotalaria spectabilis*), caused by *Diaporthe crotalariae* n. sp., both by Weber; downy mildew (*Peronospora hyoscyami*) and black shank disease (*Phytophthora parasitica nicotianae*) of tobacco, by L. O. Gratz; die-back of citrus, by B. R. Fudge; melanose and stem-end rot (*D. citri*) of citrus, by G. D. Ruehle and W. A. Kuntz; citrus scab and its control, by Ruehle; stem-end rot of citrus caused by *Phomopsis citri*, by Kuntz; plant disease survey in the Everglades, spraying and dusting celery for the control of early blight, carrot dusting and spraying for the control of leaf blight, seed treatment experiments, potato seed piece decay, testing potato seed from various sources for freedom from virus diseases, and bean yellowing, all by G. R. Townsend; the role of special elements in plant growth and injury on peat and muck soils of the Everglades, by R. V. Allison; ring spot disease (*Helminthosporium ocellum* plus other fungi) of sugarcane, brown spot disease of sugarcane, and comparative studies of varietal resistance of sugarcane to mosaic, all by B. A. Bourne; and nematode control in the Everglades, disturbances of plant nutrition in various crops, including sugarcane, associated with chloride assimilation, phosphorus availability and assimilation in shallu, oxygen balance and root respiration, and the effects of unbalanced mineral nutrition (particularly potash deficiency) on carbohydrate elaboration and progress toward maturity in sugarcane, forage crops, and truck crops, all by J. R. Neller.

[Plant disease studies in Utah] (*Utah Sta. Bul.* 250 (1934), pp. 15, 16, 18, 19, 20, 21, 36-43, 55).—The results are briefly noted of investigations dealing with the following subjects: Bacterial wilt of alfalfa, agronomic studies, by R. J. Evans; a genetic study of the resistance of wheat to physiologic forms of loose and covered smut, and bunt control, both by D. C. Tingey; similar studies with smut at Nephi Dry-Farm Substation, by A. F. Bracken; virus diseases of the potato and factors influencing their development and control, pathological aspects of psyllid yellows of potato, bacterial wilt of alfalfa, pathological aspects, and strawberry root rots, all by B. L. Richards; *Fusarium* and related wilts, bacterial canker, and mosaic diseases of tomato, and curly top and psyllid yellows of tomato, both by H. L. Blood; nature and control of chlorosis in Utah, physiological and biochemical studies of psyllid yellows of the potato, and curly top of tomato, all by F. B. Wann; and the development of chlorosis-resistant varieties of small fruits, by A. L. Wilson.

A modification in incubator construction, R. A. STEINBERG (*Phytopathology*, 24 (1934), No. 7, pp. 829-831, fig. 1).—A low cost, electrically heated incubator of 18.5-cu. ft. capacity, in which the air is circulated, is described.—(Courtesy Biol. Abs.)

Growth of microorganisms at and below 0° C., J. A. BERRY and C. A. MAGOON (*Phytopathology*, 24 (1934), No. 7, pp. 780-796, fig. 1).—Proof of the growth of numerous micro-organisms at and below 0° is reviewed in the literature from 1887 on, and demonstrated by specific experiments involving *Pseudomonas fluorescens*, *Lactobacillus*, *Torula*, *Monilia*, and *Penicillium* spp. at -4°, and *Cladosporium* and *Sporotrichum* spp. at -6.7°. The organisms mentioned were isolated from spoiled frozen-pack fruits and vegetables. Growth at such temperatures is relatively slow, although a strain of *Pseudomonas fluorescens* in 3 percent NaCl bouillon increased at -4° from 200,000 to 6,000,000 cells per cubic centimeter in 36 days. It is suggested that apart from cold, such factors

as ice formation in the substrate and oxygen supply may affect microbial growth at low temperatures. That any microbial reproduction can occur below -10° seems unlikely from the evidence. The existence of a special group of cold-loving micro-organisms is doubted.—(*Courtesy Biol. Abs.*)

Ornamental flowering plants naturally infected with curly-top and aster-yellows viruses, H. H. P. SEVERIN and J. H. FREITAG (*Hilgardia* [California Sta.], 8 (1934), No. 8, pp. 233–260, pls. 4, figs. 17).—In an effort to determine to what extent common ornamental flowering plants might become naturally infected with curly top in California, the authors, in connection with cooperative studies by the station and the U. S. D. A. Bureau of Entomology, brought to the station plants showing suspicious symptoms and placed upon them previously noninfective beet leaf hoppers (*Eutettix tenellus*), or *Cicadula divisa*, which were removed after 2 or 3 days of feeding and placed on healthy beet seedlings or healthy aster and celery plants, respectively. If the beets developed curly top symptoms or the other plants developed symptoms of yellows it was a clear indication that the originally suspected plant had been infected with the disease indicated under natural conditions. In this way 14 species of ornamental flowering plants in 13 genera belonging to 10 families were found to be naturally infected with curly top, and 8 species and 3 varieties in 7 genera belonging to 4 families were found to be naturally infected with aster yellows. These are listed. *Dianthus caryophyllus* and *Matthiola incana annua* plants were found showing reliable symptoms of curly top, but the virus could not be recovered by the method used.

Weed host range and overwintering of curly-top virus, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 8 (1934), No. 8, pp. 263–280, pls. 2, figs. 8).—This article reports the results of cooperative work between the station and the U. S. D. A. Bureau of Entomology, in which wild plants from cultivated and uncultivated areas of California showing symptoms of possible curly top infection were tested in the manner described in the foregoing article. It was found that 14 species of wild plants in 13 genera belonging to 8 families, growing on uncultivated plains and foothills, were naturally infected with curly top, as were 26 species of weeds in 15 genera belonging to 9 families occurring in the cultivated areas. The virus was found to overwinter in 11 species of annuals and 3 species of perennial wild plants growing on uncultivated areas, and in 4 species of perennials and 3 species of weeds, sometimes annual and sometimes perennial, growing in cultivated areas. Economic plants which may enable the virus to overwinter were found to include Hairy Peruvian alfalfa (*Medicago sativa*), horseradish (*Armoracia rusticana*), parsley (*Petroselinum hortense*), and potato (*Solanum tuberosum*). The author lists the weeds growing on uncultivated areas in California, and on cultivated areas in California which were successfully infected with curly top by experimental means. These include 57 species in 28 genera belonging to 16 families.

In the case of naturally infected horseradish, the virus was rarely recovered during the summer and not at all during the autumn, nor from cuttings grown from naturally infected horseradish roots.

Culture of *Phytophthora infestans*, W. CROSIER (*Phytopathology*, 23 (1933), No. 9, pp. 713–720, fig. 1).—Suggestions are given for growing *P. infestans* in pure culture and on potato foliage and tuber slices. Bacterial contamination was decreased or eliminated by incubating the inoculated tuber slices at low temperatures (4° – 15° C.) or at low relative humidities (below 90 percent). Sporulation required saturated air and took place at temperatures ranging from 3° to 26° . Viability of the sporangia was preserved only with high humidity and was prolonged by low temperature. The optimum for

swarm spore formation by the sporangia was 12°–13° and for germ tube formation 24°. The sporangia germinated only in the presence of liquid water. Various substances increased the percentage of indirect germination. Swarm spores remained motile 22 hr. at 3°, but only 30 min. at 24°. Infection by swarm spores occurred to some extent in from 1½ to 3 hr., penetration being most rapid at 20°–25°. *P. infestans* appeared to spread most rapidly in the field when the temperature favored swarm spore formation.

Humus extract agar favorable for oospore production in *Pythium*, R. D. RANDS and E. DOPP (*Phytopathology*, 23 (1933), No. 9, p. 745).—The addition of soil and humus extracts to grated carrot agar stimulated the development of normal oospores in most of a series of isolates of *Pythium* from sugarcane roots, enabling their identification. Woodland and garden soil and sugarcane filter press cake served as suitable sources of humus extract, but synthetic humic acids prepared from dextrose were ineffective.—(*Courtesy Biol. Abs.*)

An undescribed sclerotium fungus prevalent in northeast Texas, D. C. NEAL and R. E. WESTER (*Phytopathology*, 24 (1934), No. 5, pp. 528–533, figs. 4).—On decayed cotton stalks, roots, and old cotton leaves a little below the soil surface at the U. S. Cotton Breeding Station, Greenville, Tex., in September, 1932, a readily isolated, white or yellowish fungus was found which produces abundant white or yellowish sclerotia as elongate swellings along mycelial strands. Although resembling *Phymatotrichum omnivorum*, it is considered distinct on account of the apparent saprophytic habits, rapid formation of sclerotia on agar, absence of right-angled branches or acicular hyphae, and other characters, and is described as *Ozonium texanum* n. sp., with Latin diagnosis. No spore stage was found.

Fungicidal effect on *Sclerotium rolfsii* of some compounds in aqueous solution and in the gaseous state, J. OSERKOWSKY (*Phytopathology*, 24 (1934), No. 7, pp. 815–819, fig. 1).—The effect of vapors of 52 substances on mycelium and sclerotia of *S. rolfsii*, enclosed in stender dishes, was investigated at the University of California. The toxicity to sclerotia of 19 compounds in aqueous solutions was also tested. Mycelium of *S. rolfsii* was not killed, but its growth was inhibited during 2–4 days' exposure to saturated vapors of naphthalene at 29°–30° C. The vapors of α -monochloronaphthalene and α -monobromonaphthalene inhibited growth of mycelium and were lethal to some of the cultures. The mycelium was killed by the saturated vapors of trioxymethylene, benzene, toluene, xylene, nitrobenzene, and ortho-, meta-, and paradichlorobenzene.

Sclerotia were killed by 3 days' exposure, at 25°–26°, to the saturated vapors of benzene, toluene, xylene, ethylbenzene, *n*-propylbenzene, chlorobenzene, chloroform, carbon tetrachloride, bromopicrin, iodine, carbon bisulfide, and trioxymethylene. Sclerotia were killed also after immersion for 1 day in 1:33 dilution of "Merthiolate" and in 0.1 percent solution of hexylresorcinol, and for 5 days in 0.1 percent of *o*-chlorophenol.

Substitution of an NO₂ radical in the benzene ring resulted in a greater toxicity than the substitution of either NH₂, Br, or 2Cl atoms in the para position. Substitution of Br for Cl in chloropicrin enhanced the toxicity.—(*Courtesy Biol. Abs.*)

Investigations on flag smut of wheat caused by *Urocystis tritici* Koern, W. B. MILLER and C. R. MILLIKAN (*Jour. Dept. Agr. Victoria*, 32 (1934), Nos. 7, pp. 365–380, figs. 10; 8, pp. 418–432, figs. 5).—The results are reported of 3 years' investigations on the relation of environmental and other factors to the incidence of this increasingly important disease in Victoria and on varietal resistance and control. In tests where Federation wheat was sown about

every 2 weeks, the minimum temperature for spore germination in the soil was found to depend upon the moisture present and proved to be lower than 14° C. (57.2° F.), previously accepted as the minimum. In very wet soil, infection was low even when the temperature was favorable. Infection was found to be favored by absence of excessive moisture, by the occurrence of temperatures above 10° C., and by conditions which increase the duration of the susceptible stage of the wheat plant.

In testing, for resistance, 55 varieties of wheat, the seed lots were uniformly dusted with a weighed amount of smut and planted in six different localities. Fifteen varieties were classed as resistant, among them Ghurka, a rather prolific sort. Free Gallipoli, the leading Victorian variety, was very susceptible, and Federation even more so. Tests of the progeny of Nabawa (resistant) × Indian H. (very susceptible) indicated that resistance in this case is probably recessive and possibly due to a single factor difference. Selection tests for resistance within varieties were reported to have given thus far conflicting results.

The effects of fertilizer treatments were not consistent, but barnyard manure, sulfur, and sulfur compounds, notably ammonium sulfate, appeared to result in a definite decrease in infection. The rate of growth of the host appears to have an important influence on the disease. Therefore, it is held probable that the lower amount of infection on some plats was due to the increased growth of the wheat promoted by the fertilizer used. High infections were obtained on soils with pH values ranging from 5.5 to 8.7.

Reductions in yield in excess of that due to plants showing visible symptoms indicated decreased vitality in some of the remaining plants as a result of "suppressed" infection. No consistent relation could be found between the presence of infection and an abnormal abundance or deficiency of any important plant constituent. Deep sowing led to more infection than shallow. Cutting back infected plants also resulted in increased losses from flag smut.

Seed treatment with copper carbonate powder did not give complete control in cases of heavy seed-borne infection, but was reported as satisfactory under ordinary conditions. Cultural practices which tend to reduce soil contamination and infection are suggested. The use of resistant varieties, like Ghurka, is recommended as the most efficient method of preventing loss.

Ascospore discharge in *Ophiobolus graminis*, and its probable relation to the development of whiteheads in wheat, G. SAMUEL and S. D. GARRETT (*Phytopathology*, 23 (1933), No. 9, pp. 721-728).—Moistened perithecia of *O. graminis* ejected into the air as many as several hundred ascospores per minute from a single diseased wheat culm. Spore viability lasted from 3 to 4 days under dry conditions, and as much as a week under moist conditions at a temperature of 12° C. The greatest loss in South Australia occurs from the whitehead stage of the take-all disease when showery weather lasts almost until heading. In crops rapidly "going off" with a scattered whitehead infection, patches were always found where the plants had died before flowering and on which perithecia were present. This suggests that epidemics of whiteheads may result from wind-disseminated ascospores.

Reaction of alfalfa varieties to stem blight, B. L. RICHARDS (*Phytopathology*, 24 (1934), No. 7, pp. 824-827, fig. 1).—This paper from the Utah Experiment Station reports the reaction of 43 strains of alfalfa to bacterial stem blight under field conditions. The different strains exhibited wide differences in the degree to which the first crop stems were damaged by the disease. All Ladak strains remained practically free from stem blight. A single strain of Hardigan and 1 of Grimm also ranked high in freedom from the disease.

Turkistan and French varieties were among the most severely affected. Some plants in all varieties remained free from stem blight, suggesting the possibility of finding blight-resistant plants in all strains under the test. Although the results reported represent but single season observations, the number of replications of the strains and their effective distributions in the field render the data significant. No correlation was found to exist between the degree to which strains were damaged by bacterial stem blight and their reported resistance to bacterial wilt.—(*Courtesy Biol. Abs.*)

The comparative behavior of four clover-leaf parasites on excised leaves. C. E. YARWOOD (*Phytopathology*, 24 (1934), No. 7, pp. 797-806, figs. 3).—In this work at the Indiana Experiment Station, excised leaflets of red clover (*Trifolium pratense*) showing different degrees of vigor, taken from leaves of different ages and at different times of day, were floated in Petri dishes or watch glasses on water and on sucrose solutions of different concentrations. They were then inoculated with four leaf parasites.

The two obligate parasites, rust (*Uromyces fallens*) and powdery mildew (*Erysiphe polygoni*), developed best on vigorous leaflets, especially those floated on 10 percent sucrose. On the other hand, the two facultative parasites, *Macrosporium sarcinaeforme* and *Colletotrichum trifolii*, developed best and caused the most severe disease symptoms on relatively weak leaflets, especially those obtained in early morning and those floated on water or on weak (2 percent) sucrose.—(*Courtesy Biol. Abs.*)

Angular leaf spot and blackarm of cotton caused by B[acterium] malvacearum E. F. S., R. E. MASSEY (In *Second conference on cotton growing problems, July 1934—Report and summary of proceedings*. London: Empire Cotton Growing Corp., 1934, pp. 175-178).—A compact discussion is given of the disease and its control in the Sudan. Here the bacteria survive on the seed and particularly in plant remains as long as they keep dry between crops. Complete flooding of fields for 4 days resulted in successful disinfection of the plant debris.

Blackarm disease in Uganda, C. G. HANSFORD (In *Second conference on cotton growing problems, July 1934—Report and summary of proceedings*. London: Empire Cotton Growing Corp., 1934, pp. 178-185).—This paper gives a short summary of the work done on black arm of cotton (*Bacterium malvacearum*) in Uganda since 1931. The destructive stem form of the disease was found to originate from leaf infection under cool, moist conditions which prevent the leaves from drying up and forestall petiole abscission until the bacteria have succeeded in invading the stems through the petiole tissues. In Uganda, danger of stem infection is greatest in the early part of the season and again just before blooming on the sympodia. The only important source of carry-over in this region is held to be in or on the seed, but under Uganda conditions seed disinfection is held impracticable. A promising start has been made in the breeding of resistant varieties.

Cucurbit mosaic transmitted by muskmelon seed, J. B. KENDRICK (*Phytopathology*, 24 (1934), No. 7, pp. 820-823, fig. 1).—In controlled greenhouse studies by the University of California at Davis, seeds from 23 quarter-pound packets of commercial muskmelon seed, representing 12 varieties, were grown in steam-sterilized soil and protected against external infection. Seed transmission of cucurbit mosaic was demonstrated in a small number of cases, 27 seedlings showing symptoms out of a total of 11,519.

Stem-spot of rhubarb, C. O. SMITH (*Phytopathology*, 24 (1934), No. 7, pp. 832, 833, fig. 1).—The spotting on stems of *Rheum rhaponticum* has been known in California since 1914 and now occurs in many rhubarb fields. The causal

organism, *Phyllosticta straminella*, was readily isolated from the spots. Inoculations made at the Citrus Experiment Station, Riverside, Calif., produced more or less typical lesions 1-15 by 1-3 mm. in size on rhubarb stems in from 30 to 45 days. Spots are oval to elliptical and reddish brown. The fungus was isolated from 5-year-old herbarium material.—(*Courtesy Biol. Abs.*)

Sweet-potato ring rot caused by *Pythium ultimum*, R. F. POOLE (*Phytopathology*, 24 (1934), No. 7, pp. 807-814, figs. 3).—A soft, ringlike rot of sweet-potatoes occurring in storage was claimed by Halsted in 1894 (E. S. R., 7, p. 691) to be due to a *Fusarium* (*Nectria ipomoeae*) and attributed by Taubenhau in 1915 (E. S. R., 32, p. 51) to *Rhizopus nigricans*. The results of recent studies conducted at the North Carolina Experiment Station showed that the disease is due to *P. ultimum*.

A discussion is given of the activities of *P. ultimum* as compared with those of *R. nigricans* on this host. The soil is shown to be the source of infection. Prompt harvesting of the crop before wet, cold soil conditions prevail was found to give practical control.—(*Courtesy Biol. Abs.*)

Prevent storage rots of sweetpotatoes, J. I. LAURITZEN and L. L. HARTER (U. S. Dept. Agr. Leaflet 106 (1934), pp. II+5, figs. 2).—A popular discussion is given of the most effective practical means worked out for the control of black rot and wound rots, such as surface rot, charcoal rot, Java black rot, *Fusarium* rot, and *Rhizopus* soft rot.

Tomato investigations: Results of Bendigo tests.—III, Disease investigations, A. G. STRICKLAND (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 7, pp. 342-345, figs. 4).—In three successive seasons spotted wilt caused 40, 100, and 40 percent, respectively, of diseased plants. The round, smooth-skinned varieties, especially those of American origin (e. g., Norton and Marglobe), showed marked susceptibility to this disease, while the most resistant proved to be the locally popular "Pale-leaf" and South Australian Dwarf Red. Dusting tomatoes every 3 days with nicotine-sulfur or every week with elemental sulfur failed to affect the incidence of spotted wilt. Equally ineffective were shading, the insertion of copper wire into the plants, and the use of copper sulfate by irrigation or by injection.

A species of *Colletotrichum* was proved to be responsible for the "Black Dot" root rot disease of tomato, which has resulted in considerable loss in Bendigo. It appeared probable that it also caused damping-off in the seed bed, and that it is transported to the field with later serious results.

In plats from which every second irrigation was omitted, blossom-end rot was almost seven times as abundant as in plats irrigated regularly as the grower judged necessary.

Occurrence of watermelon mosaic, M. N. WALKER (*Phytopathology*, 23 (1933), No. 9, pp. 741-744, figs. 2).—According to this contribution from the Florida Experiment Station a natural occurrence of watermelon mosaic, previously known only as a result of artificial infection with cucumber mosaic viruses, was observed in Florida in 1932. Affected plants showed a distinctive crowding, stunting, and rolling of leaves. Young leaves were diffusely mottled, older ones more conspicuously so, but mottling was less characteristic than malformation. Flower abnormalities, necrosis, and shedding of blossoms also occurred. No melons set on severely stunted vines, but on vines infected late in their growth the melons showed a pronounced mottling of slightly raised, dark green areas. Evidence of spread was noticed, but only about 1 percent of the plants in the field, concentrated in certain areas, was affected. There was a concurrent heavy infestation by *Aphis gossypii*, but no mosaic-infected weeds were observed. The disease did not recur in 1933.—(*Courtesy Biol. Abs.*)

Black spot of germinating pea seed, W. CROSIER (*Phytopathology*, 24 (1934), No. 7, pp. 827-829, fig. 1).—According to this contribution from the New York State Experiment Station, pea and bean seeds germinated in the seed-testing laboratory are commonly spotted by black mycelial masses of a fungus considered to be *Dematium pullulans*. The fungus was not pathogenic to growing plants of 49 varieties of peas and beans whether inoculation was attempted by spraying or by puncture. It is believed that infestation occurs during harvesting or handling of the seed.

Vitality and vitality determination in potatoes, O. APPEL (*Phytopathology*, 24 (1934), No. 5, pp. 482-494).—The author discusses the copper probe method of Bechhold and Erbe (E. S. R., 71, p. 22) for determining the presence, in lots of seed potatoes, of tubers lacking in normal vitality and compares it with the potentiometric determination of seed potato vitality, as worked out by Wartenberg and Hey and developed at the Biological Reichs Institute for Agriculture and Forestry in Berlin-Dahlem. The latter method is considered the more serviceable. It is claimed that by its use it is possible to predict the character and extent of degeneration in a particular seed potato lot with a 100- to 120-tuber sample, that a satisfactory indication of the vitality classes and their frequency may be expected from a sample of 50 or 60 tubers, and that with only 20 or 30 tubers it can be determined whether or not there are a considerable number of degenerated tubers in the material.

Pathologic changes in the anatomy of leaves of the sugar beet, *Beta vulgaris* L., affected by curly top, K. ESAU (*Phytopathology*, 23 (1933), No. 9, pp. 679-712, figs. 10).—Curly top induced pronounced anatomical changes in affected leaves, involving hypertrophy, hyperplasia, hypoplasia, and necrosis. Necrosis was observed only in the primary and secondary phloem and pericycle. Hypertrophy and hyperplasia occurred in the phloem and pericycle before and after necrotic lesions were formed. Stimulation to growth and division of cells adjacent to lesions resembled wound-healing reactions. Phloem parenchyma, starch sheath, and cortical parenchyma participated in the proliferations near the lesions.

Abnormal, irregularly distributed xylem frequently differentiated in the proliferated tissue in the phloem region. Within leaves, this xylem was not connected with the normal xylem and, unlike normal secondary xylem, had no fibers or pitted vessels, but did have spiral vessels along with scalariform types.

Hypertrophy and hyperplasia also occurred in cortical tissue. The mesophyll cells next to the phloem, due to abnormal growth and division, became closely packed, devoid of air spaces, and had few, small, and pale chloroplasts, often of irregular shape, indicating degeneration. These changes are held responsible for the symptom called clearing of veins. Later, thickening and distortion of the veins and the formation of protuberances occurred. Hypoplasia was manifested mainly in the dwarfing and stunting of the plant.

It is suggested that the causal factor of curly top is active mainly within the phloem, and that after necrosis the changes occurring in the phloem region or outside of it are mostly secondary responses to internal injury or results of inhibited conduction.

Studies on the ring spot disease of sugarcane, B. A. BOURNE (*Florida Sta. Bul.* 267 (1934), pp. 76, figs. 23).—The author presents the results of work conducted mostly from 1930 to 1933 in the Lake Okeechobee region of Florida, together with the results of laboratory studies carried on at Cornell University. A discussion is given of the history of the disease, the symptoms and effects produced by it, its distribution, and its economic importance. Former views as to the etiology of the trouble are shown to be erroneous, and convinc-

ing proof is presented that the ring spot effect is due to the subsequent invasion of lesions already started by the eyespot fungus *Helminthosporium ocellum*, chiefly by *Phyllosticta sorghina*, and sometimes by *Nigrospora* sp., *Leptosphaeria sacchari*, or other fungi, none of which is able to attack the healthy tissue.

P. saccharicola was shown by isolation and culture work to be connected with the perfect stage, *L. sacchari*, formerly considered the primary cause of ring spot. *P. sorghina* was found on several species of *Panicum* and on *Holcus sorghum* in association with similar ring spot lesions initiated by other fungi.

The comparative susceptibility of a number of varieties of sugarcane to ring spot is reported, and the results are given of 7 yr. of breeding experiments for the development of resistant hybrids. It was found that crosses between *Saccharum officinarum* and *S. barberi* gave a high proportion of susceptible progeny, while those between the former and *S. spontaneum* gave markedly resistant seedling populations. Crosses between a sugarcane variety and two varieties of *H. sorghum saccharatus* in some instances yielded remarkably resistant types and in others rather susceptible types. There is indication that continued work may result in the development of desirable commercial types resistant to the disease.

Weak Bordeaux spray in the control of fire blight of apple, M. McCOWN (*Phytopathology*, 23 (1933), No. 9, pp. 729-733).—In tests conducted by the Indiana Experiment Station, Bordeaux mixture 1-3-50, applied early in the full-bloom period, reduced fire blight infection in Grimes blossom clusters inoculated immediately after spraying and 24 hr. after treatment. In 1931, while all the inoculated check clusters became infected only 48 percent of the sprayed clusters inoculated immediately after spraying and 50 percent of those inoculated 24 hr. after treatment blighted. In 1932, while 57 percent of the untreated check clusters blighted, only 10 percent of the sprayed clusters developed infection. Natural infection in Jonathan clusters in 1930 was reduced 67 percent by one spray of Bordeaux mixture 1-3-50 applied at full bloom. No apparent injury to fruit or foliage, and no reduction in set of fruit, was observed.

Observations on *Gymnosporangium germinale*, F. H. STEINMETZ and M. T. HILBORN (*Phytopathology*, 24 (1934), No. 7, pp. 833, 834).—From the University of Maine it is reported that apples infected by *G. germinale* were found on trees from 3,900 to 4,500 ft. distant from heavily infected *Juniperus communis depressa*. Calyx end infection has been found on 16 varieties of apples, among which Red Delicious, Golden Delicious, Cortland, and Wealthy are apparently the most susceptible commercial varieties in Maine.

Investigations on methods of control of the blue-mold decay of apples, K. F. BAKER and F. D. HEALD (*Washington Sta. Bul.* 304 (1934), pp. 32).—The heavy load of blue mold (*Penicillium expansum*) spores present in the air of packing houses was found to be the main source of fruit contamination in the State. Boxes used for picking and storage, as well as conveying and handling equipment and fruit-washing tanks, were also important sources of apple infection. In these studies *P. expansum* spores were found viable when kept air-dry for more than 2 yr. Uniformly contaminated pieces of apple boxes, when sprayed with sodium hypochlorite (0.08 percent available Cl), showed a marked reduction in the percentage of viable spores, the toxic action continuing to reduce viability for over 12 hr. Exposure for 20 min. to saturated solutions of copper sulfate, sodium carbonate, sodium bicarbonate, and sodium tetraborate did not prevent good spore germination. HgCl₂ 1-1,000 and 5 percent copper chloride killed the spores within 5 min., and a saturated solution of ammoniated

copper carbonate killed most of them within 10 min. Chemically treated apple wrapping papers proved insufficiently effective because of limited contact.

Sodium hypochlorite was tested in various strengths and for various periods of time for the treatment of both injured and uninjured apples and resulted in marked reduction in the viable spore load, as well as in the percentage of blue mold decay. When, following the usual washing treatment, fruit was treated with sodium hypochlorite rinse there was great reduction in decay. In one typical case the use of a sodium hypochlorite solution with 0.4 percent available chlorine in the second rinse tank following sodium silicate treatment resulted in reducing decay in uniformly punctured fruit from 40.2 to 6.4 percent. Treating apples in such a solution for at least 1 min. is therefore recommended, especially for fruit from orchards where considerable decay in the crop has prevailed over a period of years.

A bacterial canker of pear trees new to California, E. E. WILSON (*Phytopathology*, 24 (1934), No. 5, pp. 534-537, fig. 1).—A bacterial canker disease occurring in several counties of California on Bosc, Easter, Nelis, Hardy, and other pears (Bartlett was relatively free) is described from the California Experiment Station as attacking chiefly the cortex, which becomes spongy and light tan or buff, and over which the periderm becomes loosened and eventually transversely and longitudinally cracked. It is active in the cool weather of autumn, winter, and early spring. The necrosis occasionally penetrates to the cambium and may kill branches or entire trees. Dark streaks often extend for several inches into the apparently healthy bark beyond the upper and lower margins of the canker.

A green pigment-forming bacterium was consistently isolated from natural cankers and reproduced typical symptoms upon reinoculation into pear. It was quite unlike *Bacillus amylovorus* in characteristics and behavior, but was very similar to the organisms which have been known as *Pseudomonas cerasi* and *Phytomonas utiformica*, and to an organism producing a pear blossom blight in California which is unlike fire blight.

Variability of *Pseudomonas cerasi* in physical characteristics of growth on solid media, E. E. WILSON (*Phytopathology*, 24 (1934), No. 5, pp. 548-550, fig. 1).—Studies at the California Experiment Station have revealed that the stone fruit canker organism, *P. cerasi*, varies not only in pigment production but in colony growth characteristics. Variants from the characteristic type sometimes appeared as small, hemispherical pustules in the growth of agar stroke cultures. A single-cell culture changed from flat to convoluted type of growth, still retaining pathogenicity.

Unmasking new citrus tree root disease, A. S. RHOADS (*Fla. Grower*, 40 (1932), No. 8, pp. 6, 16, figs. 2).—This article describes the disease of citrus trees caused by *Clitocybe tabescens*, the occurrence of which in Florida was first definitely known in December 1929, although this fungus had been recognized on other hosts in that State as early as 1902. Surgical methods to remove diseased root tissues, followed by aeration and the use of a fungicide on the treated surfaces, are suggested as control measures.

Observations and notes on citrus diseases in Minas Geraes, Brazil, A. S. MÜLLER (*Phytopathology*, 23 (1933), No. 9, pp. 734-737).—This paper lists the diseases found in the noncommercial, mostly crowded, and ill-conditioned plantings of citrus in this Province. Five fungi parasitic on scale insects of citrus are also listed.

Black rot of coffee in Mysore, M. J. NARASIMHAN (*Phytopathology*, 23 (1933), No. 11, pp. 875-886, figs. 5).—The disease caused by *Corticium koleroga* is described and illustrated. In the early pellicle stage the fungus grows over the lower surface of the leaf as a white uniform film of interwoven hyphae,

Hyphal fusions occur repeatedly, forming binucleate cells. Basidia, 8.5 by 12 μ , are formed at the ends of lateral branches. The basidiospores, 9.1 by 3.4 μ , are borne at the tips of long tapering sterigmata. During this stage the fungus is entirely superficial.

During the later stage hyphal clumps (sclerotia) are formed all over the affected leaf, the intervening mycelium being thin. The color of mycelium and sclerotia changes to a fuscous brown. Hyphae emerging from the sclerotia enter the stomata and permeate the spongy parenchyma. The leaf becomes brown only after penetration. Secretion of oxidase by the hyphae is thought to cause blackening of the leaf.

There appeared to be insufficient grounds for considering, as different from this disease, similar diseases on coffee occurring elsewhere, with the exception of the thread blight in Java.—(*Courtesy Biol. Abs.*)

A *Fusarium* disease of *Cereus schottii*, A. M. McLAUGHLIN (*Phytopathology*, 24 (1934), No. 5, pp. 495-506, figs. 3).—An apparent variety of *F. oxysporum* was isolated from a large, dark-colored, sunken lesion of the rot type affecting the stem of a plant of *C. schottii* from Sonora, Mexico, and later from a plant growing at Tucson, Ariz. Pathogenicity was proved by wound inoculations. The pathogen is described and illustrated.

Positive infection trials with elm "wilt" fungi, A. S. PEIRCE (*Science*, 80 (1934), No. 2078, p. 385).—Successful wound inoculation of 3-year-old elm seedlings is reported for two strains of *Coniothyrium* isolated from diseased American elms (*Ulmus americana*) in Illinois. A strain of *Phoma* similarly isolated successfully infected and produced mature pycnidia within 5 days in the mesophyll of severed leaves, on the surface of which drops of spore suspension had been placed.

***Stereum gausapatum*, cause of heart rot of oaks**, R. W. DAVIDSON (*Phytopathology*, 24 (1934), No. 7, pp. 831, 832).—A large percentage of the many pure cultures of fungi isolated, by the U. S. D. A. Division of Forest Pathology, from decay in living oak trees in the eastern United States since 1928 have been identified as *S. gausapatum* Fr., a fungus not previously known to cause decay in living trees in the United States. This fungus, which causes a white-lined or mottled decay, may be of considerable importance in sprout-grown oaks. It seems to enter through the old stumps or dead companion sprouts.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

Game laws for the season 1934-35: A summary of the provisions of Federal, State, and Provincial statutes, H. P. SHELDON and F. G. GRIMES (*U. S. Dept. Agr., Farmers' Bul. 1742* (1934), pp. II+38).—This is the thirty-fifth annual summary of the Federal and other game laws and regulations (*E. S. R.*, 70, p. 354).

Check-list of birds of the world, Vol. II, J. L. PETERS (*Cambridge: Harvard Univ. Press*, 1934, vol. 2, pp. XVII+401).—This second volume of the check list previously noted (*E. S. R.*, 66, p. 845) lists birds of the world belonging to the orders Galliformes, Gruiformes, Diatrymiformes, and Charadriiformes that were described prior to January 1, 1933, and gives the normal range of each form.

The exotic birds of Hawaii, E. L. CAUM (*Bernice P. Bishop Mus. Occas. Papers*, 10 (1933), No. 9, pp. 55).—An annotated list of 96 forms of exotic birds of Hawaii is presented in connection with a list of 30 references to the literature.

Status of waterfowl in 1934, W. B. BELL and E. A. PREBLE (*U. S. Dept. Agr., Misc. Pub. 210* (1934), pp. 18, figs. 24).—This contribution, which pre-

sents maps with the breeding ranges of the more important waterfowl in North America, is an enlarged edition of that previously noted (E. S. R., 71, p. 215).

Local investigations on the introduced tropical American toad *Bufo marinus*, C. E. PEMBERTON (*Hawaii. Planters' Rec.*, 38 (1934), No. 3, pp. 186-192, figs. 2).—The giant tropical American toad *B. marinus*, introduced into Hawaii more than 2 yr. previously from Puerto Rico (E. S. R., 69, p. 70) has increased to many thousands from an original field liberation in April 1932 of 80 in a taro patch bordering a rice field at Waipio, Oahu, and 68 in some swampy land in the Manoa Arboretum at the head of Manoa Valley, Honolulu. Commencing in May 1933, a few distributions were made from these points to other localities on Oahu. During the latter half of the year the species rapidly gained headway, and by its end 947 had been moved to many places on Oahu and some had been sent to other islands. In the first half of 1934, thousands were obtainable at Waipio and distributions were made to every plantation in the Territory to a total of 103,517 by July 23, 1934.

The eggs, estimated to total at least 10,000 per egg mass, hatch within a few days after oviposition, some kept under observation during May 1933 having commenced to hatch in 2 days and 20 hr. Egg masses have been found in the field at Waipio in almost every month of the year. The tadpole stage, under natural conditions, occupies about 30 days. While the newly developed toad is hardly over $\frac{1}{4}$ in. long, the growth is rapid and they seem exceptionally able to find and capture all the insect food that they require. At the age of 3 mo. their length varies from $2\frac{1}{2}$ to 3 in. and they swallow mature Chinese grasshoppers, *Oxya chinensis*. One of two young toads placed in a cage in February 1933 and fed all that they would eat up to July 23, 1934, attained a length of 6 in. and more than 4 in. in width at the widest part. It is estimated that in order to attain such growth in $16\frac{1}{2}$ mo. an individual toad consumes from 1,500 to 2,000 insects of various kinds. From the local observations of the author it "is apparent that *B. marinus* will eat any insect that comes within its reach, large or small, providing the toad has grown sufficiently to enable the victim to pass down its throat. We have fed them grasshoppers, army worms, beetles, earthworms, scorpions, wasps, moths, bees, house lizards or geckos, ants, many sorts of caterpillars, snails in the shell, cockroaches, and sow bugs or slaters, all of which were taken with little discrimination. The geckos are usually too quick and secretive to be caught without our assistance."

Attempts to breed this toad in confinement are said to have been unsuccessful. It is evident from the few records kept of the length of life of the toad in confinement in other countries that they will live for many years. Reference is made to a published account of a European toad, *B. vulgaris*, that was kept in a box and provided with food and water for 12 yr., at the end of which period it remained unchanged and normal.

Lizards as a factor in the control of range insects, G. F. KNOWLTON (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 998-1004).—Data secured by the Utah Experiment Station through microscopic examination of the stomach contents of 5,446 range lizards, including 12 forms and extending over a period of four seasons, indicate that lizards render a distinct service to the livestock industry in the Rocky Mountain areas. They are said to be abundant in many parts of Utah and to be active during the entire warm season.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 973, 1100-1104).—The notes here contributed (E. S. R., 72, p. 74) are as follows: Collecting Hydrophids with Pyrethrum Flower Dust, by E. A. Richmond (p. 973); Another Species of Thrips [*Frankliniella gossypii* Morg.]

on Citrus Fruits, by H. J. Quayle (p. 1100), contributed from the California Citrus Experiment Station; An Artificial Food Medium for the Mediterranean Fruit Fly (*Ceratitidis capitata* Wied.), by R. H. Marlowe (p. 1100); Food Plant Studies of the Chinch Bug, by B. D. Burks (pp. 1100, 1101); Difference in Action of Derris and Pyrethrum against the Imported Cabbage Worm Shown by Experiments with Gelatin Films Containing These Plant Materials, by M. C. Swingle (pp. 1101, 1102); Nicotine Kills Codling Moths, by W. S. Hough (pp. 1102, 1103), contributed from the Virginia Experiment Station; A Note on Barium Fluosilicate Injury to Dahlia Flowers and the Results of a Test to Determine the Toxicity of This Material to Blister Beetles [Margined Blister Beetle], by L. W. Brannon (p. 1103); and Notes on the Occurrence of the European Weevil [Clover Head Weevil], *Tychius (Miccotrogus) picirostris* Fab., in Western Washington, by W. W. Baker (pp. 1103, 1104).

[Contributions on insect pest control in Alabama] (*Alabama Sta. Leaflets* 8 (1934), pp. 4; 9, pp. 8, figs. 6; 10, pp. 8, figs. 3).—These leaflets on the control of insect pests are as follows: No. 8, Control of Insect Pests in Stored Grains, Peas, and Beans; No. 9, Control of Corn Insects and Diseases; and No. 10, Control of Cotton Insects and Diseases.

[Contributions on economic insects and other animal pests in Colorado] (*Colo. Agr. Col. Circs.* 58 (1933), pp. 12, figs. 6; 59 (1934), pp. 16, figs. 10; 60 (1934), pp. 8; 61 (1934), pp. 23, figs. 12; 62 (1934), pp. 28, figs. 14).—Practical contributions from Colorado include the following: The Alfalfa Webworm (*Loxostege commixtalis* Walker), by J. L. Hoerner; How to Control Grasshoppers, by F. T. Cowan; Recommendations for Codling-Moth Control in Colorado for 1934, by G. M. List and J. H. Newton; Some Colorado Rodent and Bird Pests with Suggestions for Control, by W. L. Burnett; and Introduction to Beekeeping, by R. G. Richmond.

[Work with economic insects and control of insects and rodents by the Florida Station] (*Florida Sta. Rpt.* 1933, pp. 75, 76–80, 149, 150, 151, 169–171, 177–179).—Reference is made (E. S. R., 69, p. 231) to the Florida flower thrips (*Frankliniella insularis* and the gladiolus thrips) and the onion thrips, by J. R. Watson; the introduction and study of *Leis dimidiata 15-spilota* Hope, by Watson and W. L. Thompson; the larger plant bugs on citrus and truck crops (including *Utethesia bella*, the leaf-footed bug, and *Acanthocephala* spp.), by H. E. Bratley; lime-sulfur as a control for scale, rust mite, purple mite, 6-spotted mite, and white fly, and dry wood termites (*Neotermes castaneus* Burn.) as enemies of citrus, by Thompson; the potato leaf hopper, by A. N. Tissot; the green citrus aphid *Aphis spiraeicola*, by Watson, Thompson, and Tissot; control of the cigar casebearer, by F. W. Walker; the beet army worm on *Asparagus plumosus*, by J. W. Wilson; insect and other animal pests of watermelons, by C. C. Goff; diseases of citrus aphids, by W. A. Kuntz; cutworms (granulate and black), potato leaf hopper, aphids, corn ear worm, cucumber beetles (12-spotted and striped), prevalence and control of the sugarcane borer in south Florida, including work with parasites (*Trichogramma minutum*, *Ipobracon*, and *Paratheresia*), and prevalence and control of rats, all by R. N. Lobdell.

[Contributions on economic insects] (*Mass. Fruit Growers' Assoc. Rpt.*, 40 (1934), pp. 26–34, 53–73, 78–80).—Contributions are presented as follows: The Possibilities of Parasites in the Control of the Oriental Fruit Moth, by H. W. Allen (pp. 26–34); Trends in Codling Moth Control, by R. L. Webster (pp. 53, 54, 56–64, 66–70); Orchard Insect Pests of 1933 in Massachusetts, by A. I. Bourne and W. D. Whitcomb (pp. 71–73); and Apple Pest Control Project No. 27, by S. L. Davenport (pp. 78–80).

[Report of work with economic insects by the Utah Station] (*Utah Sta. Bul.* 250 (1934), pp. 45-51).—Results for the biennium ended June 30, 1934 (E. S. R., 68, p. 215) included those from lizard food-habit studies, beet leaf hopper investigations (including control by the small desert lizard *Uta stansburiana stansburiana*), psyllid yellows of the potato—insect aspect, mosquito control, and insect transmission of equine encephalomyelitis studies, all by G. F. Knowlton; and the alfalfa weevil and miscellaneous insects in relation to alfalfa, chalcid fly in alfalfa seed, and tarnished and superb (*Adelphocoris superbus* Uhler) plant bugs and thrips (*Thrips occidentalis* Perg.) in relation to alfalfa seed production, all by C. J. Sorenson.

[Contributions on sugarcane insect pest control in Queensland] (*Cane Growers' Quart. Bul.* [Queensland], 2 (1934), No. 1, pp. 1-8, 9, 10, 15-18, 21, 22, figs. 2).—The contributions presented are as follows: The Control of Insect Pests of Sugar Cane, by R. W. Mungomery (pp. 1-8); The Resistance of the Seedling S. J. 4 to Grub Damage in North Queensland (pp. 9, 10); Experiments with White Arsenic as a Means of Controlling Grubs (p. 15); Control of Cane Grubs [*Lepidoderma albobirtum*] in North Queensland by Fumigation, by H. G. Knust (pp. 16-18); and Cane Borers in the Mackay District, by W. A. McDougall (pp. 21, 22).

Insect enemies of wheat and its products, C. H. BRIGGS (*Northwest. Miller*, 180 (1934), No. 1, Sect. 2, pp. 48, 49, figs. 10).—Lists are given of the insects infesting (1) growing wheat and (2) stored wheat and flour.

Entomological investigations on the spike disease of sandal, XIX-XXIV (*Indian Forest Rec.*, 19 (1934), No. 9, pp. 30, pls. 2; 20 (1934), Nos. 1, pp. 25, pls. 3; 4, pp. 12, pl. 1; 5, pp. 15, fig. 1; 6, pp. 14, pl. 1; 9, pp. 31, fig. 1).—Continuing studies previously noted (E. S. R., 71, p. 671), part 19 deals with the life history and morphology of *Petaloccephala nigrilinea* Walk. (Jassidae, Homoptera), by N. C. Chatterjee; part 20 with studies on insect transmission, by C. Dover and M. Appanna; part 21 with the Thysanoptera, by T. V. Ramakrishna Ayyar; part 22 with the Formicidae (Hymenoptera), by D. Mukerji; part 23 with Anthicidae (Coleoptera), by R. F. Heberdey (in German with English abstract); and part 24 with the Pentatomidae (Hemiptera), by N. C. Chatterjee.

The fauna of Palestinian plants, I-III (*Bul. Soc. Roy. Ent. Égypte*, 23 (1930), No. 1, pp. 57-59, figs. 5; 24 (1931), No. 3-4, pp. 164-187, figs. 80; 25 (1932), No. 4, pp. 204-217, pl. 1).—The fauna of *Asphodelus microcarpus* is dealt with by J. Carmin, that of *Ficus sycomorus* and of *Alhagi maurorum* by J. Carmin and D. Scheinkin.

Allergic response to dust of insect origin, H. RANDOLPH (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 8, pp. 560-562).—The author's studies are said to have demonstrated the presence of atopic substances in the coverings of the range caterpillar moth, in the spines of the larvae, and in the material left behind in the eggshells after emergence of the larvae, capable of producing hay fever and asthma in an entomologist whose work required contact with the offending substance. Successful hyposensitization therapy was carried out. Few allergic individuals give a weak positive reaction to this substance.

Field tests of the efficacy of colored light in trapping insect pests, W. B. HERMS and J. K. ELLSWORTH (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1055-1067, figs. 5).—The authors record the results of work with the Clear Lake gnat (*Chaoborus lacustris*), which appears to have no selective color response, the rate of attraction being due to a function of intensity and not to a function of difference in wave length of the light; the influence of high intensity on worminess (codling moth) in apples; color repellency and color attraction; and the

effect of color on worminess in apples, on dried-fruit insects (*Ephestia* and *Plodia*), the artichoke plume moth, and the grape leaf hopper.

Airplane vapor spraying.—A progress report, F. B. HERBERT (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1040-1042).—In this further discussion of airplane vapor spraying (*E. S. R.*, 70, p. 501), it is pointed out that oil sprays have proved to be fast, efficient, and economical.

Recent developments of the Vapo Dust method of pest control, W. B. PARKER (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1036-1040).—This contribution relates to Vapo Dust, which is a trade name for a concentrated fluid insecticide or fungicide, atomized, diluted, and carried with air. It is pointed out that this Vapo Dust process has several advantages over the old methods, and that a large area can be rapidly covered with a small amount of very toxic material, the insects not only being contacted on the vine but most of the active forms blown out into the enveloping fog where they are very completely wet.

The efficiency of carboxide gas as an insecticidal fumigant for naval and merchant vessels, E. W. BROWN (*U. S. Naval Med. Bul.*, 32 (1934), No. 3, pp. 294-317, pl. 1, figs. 6).—This is a report of tests conducted on naval and merchant vessels to determine if the use of Carboxide is economically practicable for the extermination of bedbugs and cockroaches (*E. S. R.*, 70, p. 208). Part 1 (pp. 294-308) deals with tests on naval vessels, part 2 (pp. 309-313) with tests on merchant vessels, part 3 (pp. 313-315) with Carboxide requirements for different classes of naval vessels, and part 4 (pp. 315, 316) with Carboxide v. hydrocyanic acid gas fumigation.

A new insecticide with much promise: Derris, a tropical plant, found to be especially promising for cabbage worms and Mexican bean beetle, H. C. HUCKETT (*Farm Res. [New York State Sta.]*, 1 (1934), No. 1, pp. 4, 5, 6, 7).—A brief practical account of derris and its insecticidal value.

The tank-mixture method for dormant oil spraying of deciduous fruit trees in California, A. D. BORDEN (*California Sta. Bul.* 579 (1934), pp. 20, figs. 5).—The studies conducted, the details of which are presented in tables, have shown the tank-mixture method (*E. S. R.*, 67, p. 563) to be a practical, economical means of obtaining a dormant spray for deciduous fruit trees. The saving in cost of material is said to be approximately one-half, and the coverage and oil-depositing properties of this spray to be better than any other thus far tested. "Proper agitation in the spray tank can readily be obtained by installing a sufficient number of the new flat, square-end agitators. Over 5,000,000 gal. of dilute spray made by the tank-mixture method were applied by fruit growers to the orchards in six counties in northern California during the season of 1933. No injury has been recorded, and the control has been most satisfactory."

Some reared insect parasites and their hosts, C. H. HICKS (*Colo. Univ. Studies*, 21 (1934), No. 4, pp. 265-271, figs. 3).—Records obtained during a period of rearing and study of insects, extending over several years, in the vicinity of Boulder, Colo., in which many interesting host species, parasites, and nest records were secured, are summarized and presented in connection with a list of 16 references to the literature.

A monograph of the Collembola of Iowa, H. B. MILLS (*Ames, Iowa: Collegiate Press*, 1934, pp. VII+[1]+143, figs. 189).—Following an introduction in which the collection and preservation, morphology and terminology, and classification of Collembola are considered, the author deals with the order Collembola Lubbock 1870 (p. 6), the suborder Arthropleona Börner 1901 (pp. 7-84), and the suborder Symphypleona Börner 1901 (pp. 85-108). Of 132 species, representing 43 genera, recognized as occurring in Iowa, 33 species are described as

new. The genus *Neosminthurus* is erected. A bibliography of 5 pages and an index are included.

Fumigation for European earwig (*Forficula auricularia* Linn.) in balled nursery stock, J. B. STEINWEDEN (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 919-923).—The author reports that "vacuum fumigation with HCN of large quantities of balled evergreen nursery stock infested with European earwig has proved ineffective, due to the fact that a dosage which the plants would safely withstand was not strong enough to kill earwigs within the earthen balls. Individual plants can be fumigated effectively and safely with calcium cyanide by dusting the fumigant around the ball inside of the burlap covering and then wrapping the ball tightly in a rubber tarpaulin. The amount of calcium cyanide varies with the size of the plant, but 0.75 oz. is recommended for a medium-sized plant such as a 3-ft. *Erica*, for a fumigation time of 24 hr. Paradichlorobenzene used in the same manner as calcium cyanide at the rate of 1 oz. for a small plant for a fumigation time of 48 hr. is effective only against earwigs under the burlap coverings of the balls and not against those buried in the soil. Naphthalene flakes used at the rate of 1 oz. per each small plant for 48 hr. to 96 hr. was not effective against earwigs in the balls."

Fertility and climatic adaptations in Siberian grasshoppers, I. A. RUBTZOZ (*Bul. Ent. Res.*, 25 (1934), No. 3, pp. 339-348).—In investigations on the most common East Siberian grasshoppers, a list of which is given, the author has found that "the number of egg tubes and the number of eggs in each tube varies in accordance with the food and the climatic and microclimatic conditions of each habitat. The majority of Siberian grasshoppers have adaptations in the ovaries which enable them to take full advantage of the available heat. In the species possessing 10 or more egg tubes, their number varies in different parts of the distribution area. It decreases toward the center of the area with increasing warmth and dryness, and increases toward the colder and more humid margins of that area (e. g., in the Far East and in western Europe).

"The potential fertility is more or less stable in different species of grasshoppers, and in the species studied it fluctuates between 84 and 388 eggs per female. There is no correlation between the potential fertility and the abundance of the species in nature, for the greater fertility is met with in those species which occur but rarely. The injurious (i. e., very numerous) grasshoppers have a medium, or somewhat less than a medium, potential fertility. The actual fertility is greatly dependent on the environment and has a wide range of fluctuation. Lack of food in reservations was observed to lower the fertility of grasshoppers by 30 to 40 percent. The parasites (*Blaesoxipha* spp., *Mermis* spp.) greatly reduce the degree of fertility of the Siberian grasshoppers. However, the percentage of infestation by these parasites is low, but in the reservations it is somewhat higher than outside. Thus, the actual fertility in reservations is rather lower than outside.

"The outbreaks of the Siberian grasshoppers are determined by the climatic and microclimatic conditions. The fluctuations in fertility never have any real importance in causing the outbreaks. Lack of food, parasites, predators, and diseases are of minor importance; among the latter the main factors are the diseases of the egg pods, which again depend on the microclimate."

A list of 20 references to the literature is included.

The conditions of sexual maturation in the migratory locust, V. P. POSPELOV (*Bul. Ent. Res.*, 25 (1934), No. 3, pp. 337, 338).—This is a report con-

tributed from the Leningrad Institute for the Control of Pests (E. S. R., 56, p. 360).

The temperature and humidity relations of the cockroach (*Blatta orientalis*).—I, Desiccation, D. L. GUNN (*Jour. Expt. Biol.*, 10 (1933), No. 3, pp. 274-285, figs. 5).—It was found that *B. orientalis* dies from heat stroke at a minimum temperature between 36° and 40° C., and that it will die from desiccation at any of the temperatures and humidities studied, but the speed of desiccation increases very rapidly above 30° (86° F.), owing to the form and mode of action of the tracheal system. Desiccation sets an upper limit to the temperature range of the species, which is below the heat-stroke temperature.

Factors influencing pear thrips abundance and effectiveness of cultural control, S. F. BAILEY (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 879-884).—In this contribution the author calls attention to some of the factors influencing the abundance of the pear thrips and some of the probable reasons for the inconsistency of cultural practices employed as control measures.

Preliminary observations on cotton stainers and internal boll disease of cotton in S. Africa, E. O. PEARSON (*Bul. Ent. Res.*, 25 (1934), No. 3, pp. 383-414, pls. 2, figs. 16).—It has been found that all species of *Dysdercus*, including *D. fasciatus*, *D. nigrofasciatus*, and *D. intermedius*, transmit *Nematospora gossypii* and *N. coryli*, a cause of the internal boll disease, although they are not efficient vectors until the fourth instar is reached. Adult stainers collected on wild food plants (*Gossypium herbaceum africanum*, *Hibiscus* spp., and *Sterculia rogersii*) have been shown to be infected with *N. gossypii*. "The etiology of the disease produced by both species of *Nematospora* has been followed in inoculation experiments, using pure cultures. The rate of spread of the disease varies with the age of the boll at the time of inoculation, being slower when the boll has passed middle age. In neither species does staining extend beyond the loculus in which infection starts, not does the fungus occur within the seed except following direct puncturing of the seed."

Cicadas in relation to agriculture, F. H. WYMORE (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 884-891).—In this contribution the author considers some of the outstanding cases of injury to cultivated plants by cicadas, based upon observations in California during the past several years. It is pointed out that the injury may be produced by feeding, oviposition, and possibly by transmission of disease. A list of 15 references to the literature is included.

The apple leaf-hopper *Typhlocyba australis* Frogg., L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol.*, 16 (1934), No. 1, pp. 30-38, figs. 5).—This insect came into prominence as a pest of apple in New Zealand about 1918 and was recorded at the same time as an apple pest in Australia. The eggs of the leaf hopper were found in the spring of 1932 parasitized by a species of *Anagrus* which appears to be identical with *A. armatus* Ashm. var. *nigriventris* Gir., occurring in the United States. About 80 percent of the overwintering leaf hopper eggs have been found to be parasitized by it. Reference is made to other parasites of this leaf hopper that may be introduced. A list of 16 references to the literature is appended.

The number of generations of the beet leafhopper under natural conditions, E. D. BALL (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 945-959, figs. 5).—A report based upon observations made in Utah, Idaho, Oregon, California, and Arizona.

The double treatment for scale pests in California citrus orchards, R. S. WOGLUM and J. R. LAFOLLETTE (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 978-980).—This contribution relates to the development of the treatment of in-

fested orchards with an oil spray, followed by cyanide fumigation, which in California has proved of outstanding value in recent years in cleaning up infestations of scale pests too severe to be controlled by a single application. The original interval of 2 days to 2 weeks between spray and fumigation has been little modified in commercial work. There have, however, been various changes in the dosage and season of application.

Fumigation experiments with the California red scale under orchard conditions, W. MOORE (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1042-1055, fig. 1).—It has been found in field experiments that a kill of 99 percent or better can be obtained with 100 percent dosages of hydrocyanic acid in all areas where the California red scale is classed as resistant. "The difficulty in killing red scale by hydrocyanic acid fumigation in certain areas in California cannot be due to an acquired tolerance to hydrocyanic acid, since good kills and very poor kills may be obtained in the same orchard even on the same night. A series of fumigations during the summer season indicate that when the hydrocyanic acid is applied by atomization, the kill diminishes as the temperature increases. In winter fumigations this relationship between kill and temperature is masked by other factors. Winter fumigations, in which the hydrocyanic acid is applied with the atomizer, show poorer kills when the relative humidity is below 50 percent. Winter fumigations in which the hydrocyanic acid is applied with the Diffuser show the kills independent of relative humidity. Poor kills obtained during the winter where the hydrocyanic acid is applied with the atomizer are due to low soil temperatures, causing faulty distribution of the gas in the tent. The average kill of a series of fumigations with the Diffuser is higher than the average kill obtained with the atomizer and is more uniform. The red scale is most difficult to kill at the end of the second molt. In fumigations where results are poor, survivors occur in all stages of development, not merely in the second molt."

Temperature and humidity in relation to HCN fumigation for the red scale, H. J. QUAYLE and P. W. ROHREBAUGH (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1083-1095, figs. 5).—This contribution from the California Citrus Experiment Station is a more extended account than that previously noted (E. S. R., 72, p. 225).

"No significant differences were indicated in these studies as to the effect of humidity, within a range of from 50 to 80 percent, on fumigation results on the red scale. In the case of high relative humidities, 85 to 100 percent, there was a decrease in fumigation results as compared with low relative humidities of from 27 to 40 percent. In tent fumigation there is generally considered to be an increase in kill through the tightening of the tent in case of high humidity.

"Gas concentration studies under wet and dry tents indicated a greater concentration under a wet tent, but the decrease in concentration was about the same in each case, due probably to the absorption of gas by the wet tent corresponding to the escape of gas through the dry tent. At a relative humidity of 70 percent there was greater injury to the plants when they were preconditioned and fumigated at a low temperature (50°) than at a high temperature (90°). Where the soil was allowed to become very dry, without the plants wilting, as compared with very wet soils, a greater number of rooted lemon cuttings were injured in the dry than in the wet soils."

The San Jose scale (*Aspidiotus perniciosus*) a menace to European fruit culture [trans. title], A. BALACHOWSKY (*Rev. Path. Vég. et Ent. Agr.*, 19 (1932), No. 4, pp. 130-158).—This contribution on the San Jose scale is presented with a list of seven references to the literature.

The position of nicotine in codling moth control, R. L. WEBSTER and J. MARSHALL (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 873-878).—In studies at the Washington Experiment Station it was found that "when nicotine sulfate 1:600 with soap was used in the place of lead arsenate 2:100 in the second and third cover sprays in 1927 less efficient codling moth control was secured, especially in Spitzenburg apples. Nicotine sulfate, 1 pt. to 800 gal. of water, was much less efficient than lead arsenate 2:100 when both were applied throughout the season on Romes in 1928. The oil-nicotine combination (1 gal. summer oil, 0.5 pt. nicotine sulfate, 100 gal. water) used throughout the season resulted in better control than lead arsenate 2:100 on Romes in 1928. Used throughout the season on Romes in 1929, the oil-nicotine combination was approximately equivalent to lead arsenate 2:100. Oil-nicotine in the last two cover sprays on Jonathans in 1929 improved codling moth control over lead arsenate 2:100. Oil-nicotine in the last two cover sprays on Romes in 1930 resulted in only slightly better control than when lead arsenate 3:100 was applied. On Jonathans in 1930 oil-nicotine in the last two covers, oil-lead arsenate in second cover, lead arsenate 3:100 otherwise gave results only slightly better than lead arsenate 3:100. Oil-nicotine in the last two cover sprays on Romes in 1931 was practically equivalent to lead arsenate 3:100, probably due to continued worm activity late in the season. The use of the oil-nicotine combination in late cover sprays in 1932 on Romes resulted in a degree of control no better than with lead arsenate 3:100 throughout the season. A heavy worm infestation in 1932 resulted in high counts of wormy fruits on all sprayed plats. There was little difference in worm control on Romes in 1931, also in 1932, when the oil-nicotine tannate combination was used in place of lead arsenate in the last two cover sprays, as compared to lead arsenate 3:100 used throughout the season. In a spray schedule of oil-nicotine in the last three cover applications, oil-lead arsenate in second cover, lead arsenate 3:100 in remaining cover sprays, codling moth control was greatly improved over lead arsenate 3:100 for six cover sprays on Delicious in 1933. The use of mineral oil following lead arsenate made lead residue removal more difficult than when lead arsenate was used alone."

Codling moth in Canterbury: An investigation into the life-history and habits of the codling moth during the season 1932-33, A. HAMILTON (*New Zeal. Jour. Sci. and Technol.*, 16 (1934), No. 1, pp. 1-8, figs. 4).—A report of a biological study conducted in New Zealand in 1932-33.

Platynota stultana Wlsm. (Lepidoptera) **damaging green oranges in southern California**, E. A. MCGREGOR (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 974-977, figs. 3).—This contribution relates to a tortricid first observed by the author late in May 1933 attacking immature oranges in southern California. The larvae were found operating in the space between the sepals and the base of the fruit and within loosely spun webbing. The feeding consists of gnawing and rasping of the calyx and stem, but especially of the rind near the base of the orange. Less frequently the worms may feed on the sides of the orange or within the cavity at the navel end (of navel oranges). The typical damage consists of a ringlike series of scars around the stem end of the fruit.

It is concluded that in navel orchards affected by *P. stultana* commonly about 10 percent of the crop is made unmarketable by the dwarfing effect of this insect, which is known as the "orange calyx moth." Reference is made to damage by this pest reported by Woglum in 1920 (E. S. R., 45, p. 360) and referred to as *P. tinctana* (Walk.).

Observations made in the affected districts during the summer of 1934 are said to have revealed that the tortricid worm *Argyrotaenia citrana* Fern. is

also causing damage to green oranges quite similar to and more extensive than that of *P. stultana*.

The leaf miners of plum and cherry [trans. title], M. HERING (*Anz. Schädlingsk.*, 10 (1934), No. 5, pp. 51-55, figs. 7).—A table for the identification of the insect leaf miners of plum and cherry is followed by an annotated list of 24 species of Lepidoptera and 2 of Coleoptera found implicated.

Notes on host materials of *Ephestia figulilella* Gregson, H. C. DONOHUE and D. F. BARNES (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1075-1077).—The authors have found the field hosts of the raisin moth *E. figulilella* to include waste mulberries, plums, prunes, grapes, figs, apricots, nectarines, peaches, peach-pit kernels, pears, cherries, apples, and dates. This succession of fruits provides for the entire annual cycle of the insect in the field. Its increase in these waste fruits largely explains its usual abundance during the harvesting and drying of the various commercial fruit crops.

Experiments in the exclusion of *Ephestia figulilella* Gregson from drying fruit, H. C. DONOHUE, D. F. BARNES, C. K. FISHER, and P. SIMMONS (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1072-1075).—The use of tobacco shade cloth on the ranches after the picking of the crop has been found to offer promise as a method of excluding infestation by *E. figulilella* in drying and dried fruits. Preliminary tests in the protection of figs, apricots, nectarines, peaches, and raisins were uniformly successful.

Notes on field trapping of Lepidoptera attacking dried fruits, H. C. DONOHUE and D. F. BARNES (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1067-1072).—The authors have found a mixture of 0.25 pt. of malt sirup and 2 qt. of water plus yeast renewed twice weekly to be of value as a trap material in the experimental trapping of the raisin moth *Ephestia figulilella* Greg. and other stored products Lepidoptera and their parasites in vineyards and orchards. "Three seasons' operation of such traps in a variety of locations has shown the presence in the field of several species usually thought of as storage pests only. In addition to the raisin moth, these included the chocolate moth, *E. clutella*; the Mediterranean flour moth, *E. kuehniella*; the Indian meal moth, *Plodia interpunctella*; the meal snout moth [meal moth], *Pyralis farinalis*; and the dried fruit moth, *Vitula serratilineella*. *Ephestiodes nigrella*, a minor pest of dried fruits, was taken in limited numbers. Parasites of *Ephestia* and *Plodia* taken in the baits included *Microbracon hebetor*, *Nemeritis canescens*, and *Mesostenus gracilis*."

Investigations on the control of the American and red bollworms of cotton in S. Africa, F. S. PARSONS and G. C. ULLYETT (*Bul. Ent. Res.*, 25 (1934), No. 3, pp. 349-381, pl. 1, figs. 12).—This preliminary contribution reports upon boll studies commenced in 1929, particularly of the biology of the bollworm and the breeding and experimental releases of the egg parasite *Trichogramma lutea* Gir. and other egg and larval parasites of both the bollworm and the red bollworm (*Diparopsis castanea* Hamps.). The tachinid *Sturmia inconspicua* Meig. is said to be the only larval parasite of importance under natural conditions, but this fly does not parasitize young larvae. The breeding and experimental releases of the larval parasite *Microbracon brevicornis* Wesm. are discussed. A species of *Phanurus* and *T. lutea* were found to be important egg parasites. An anthocorid bug, *Orius* sp., destroys large numbers of bollworm eggs and probably also young larvae and, together with certain species of ants, is the most important agent in natural control.

The tobacco stem-borer (*Phthorimaea heliopa* Lw.), J. C. HUTSON (*Trop. Agr. [Ceylon]*, 83 (1934), No. 1, pp. 64-66, pl. 1).—A preliminary note is given on the stem-borer, said to be the most important insect pest of tobacco

in Ceylon and found wherever this crop is grown on the island. The account includes illustrations in color showing the several stages and the nature of its work.

Mosquito control in California under the CWA, W. B. HERMS (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1014-1029, figs. 3).—This is an extended report of mosquito control work conducted from December 1933 to April 1934, inclusive, under CWA funds.

An annotated bibliography of the Hessian fly, *Phytophaga destructor* (Say), J. S. WADE (*U. S. Dept. Agr., Misc. Pub.* 198 (1934), pp. 100).—An annotated bibliography of 1,256 titles to June 30, 1933, with a chronological index.

Studies on the seed-corn maggot, IV, C. HARUKAWA, R. TAKATO, and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch.*, 6 (1934), No. 2, pp. 219-253, figs. 4).—This contribution reports upon the results obtained from studies conducted in continuation of those previously noted (*E. S. R.*, 71, p. 676). The food of the larva, longevity of the adult insect, preoviposition period, relation of temperature to the development of the seed-corn maggot, dormancy in the seed-corn maggot, and effect of soil moisture on the development of the seed-corn maggot are considered, the details being presented in tabular form.

Relation of oviposition punctures of the Mediterranean fruit fly to the premature dropping of citrus fruits.—Preliminary report, C. B. KECK (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 908-914, figs. 2).—The dropping of citrus fruits in Hawaii has been correlated with oviposition punctures of the Mediterranean fruit fly. "Where citrus trees were screened to protect the fruits from fruit fly oviposition punctures, the fruits remained on the trees several months longer than on unscreened check trees. A disease of citrus fruits, the olive-green mold, caused by the fungus *Penicillium digitatum* Sacc., has been isolated from oviposition punctures, and the ovipositors of female fruit flies collected in the citrus grove have been found to be contaminated with the spores of this organism. Some data indicated that the female fruit fly may actually inoculate the fruit with spores of the olive-green mold at the time of oviposition. It is believed that the dropping of fruits as a direct or indirect result of oviposition punctures by the Mediterranean fruit fly is the most important crop damage resulting from the presence of the Mediterranean fruit fly in citrus groves in Hawaii."

Effect of low temperatures on the Mediterranean fruit fly in infested fruit, A. C. MASON and O. C. McBRIDE (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 897-902).—In work conducted in Hawaii with the Mediterranean fruit fly it was found that complete mortality of all the immature stages was obtained "after infested fruit had been held for 8 to 11 days at internal temperatures of 29° to 31° F. Citrus fruits, mangoes, and guavas were not seriously injured when held at these temperatures for the period of the experiments. The time for complete mortality of all stages of the fruit fly was shown to range from 18 hr. at 10° up to 11 days at 31°."

The lethal effect of sea water on the larvae of the Mediterranean fruit fly (*Ceratitis capitata* Wied.), R. H. MARLOWE and T. H. HONG (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 914-919).—It has been found that larvae of the Mediterranean fruit fly when placed in sea water are unable to adjust themselves to the environmental change which occurs as the fruit absorbs salt water, and the maggots either succumb or leave the fruit in order to find a more favorable habitat. When infested fruits that had not been in the sea for an adequate time to insure complete mortality were removed to a favorable place, the larvae emerged and completed their normal development, indicating

that it is possible for infested fruits, when thrown into the sea near land, to be washed ashore and serve as a source of fruit fly introduction. Larvae which do not pupate in salt water become inactive and die, the submergence time for complete larval mortality ranging from 48 to 60 hr.

The olfactory responses of flies in a new type of insect olfactometer.—I, Theory and design of the olfactometer, W. M. HOSKINS and R. CRAIG (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1029–1036, figs. 2).—This first contribution considers the requirements and design of an insect olfactometer.

Sheep-maggot flies in Scotland, J. RITCHIE (*Scot. Jour. Agr.*, 17 (1934), No. 3, pp. 249–260, figs. 5).—This contribution deals with the condition of the sheep maggot fly in 1933, nature of strike and species responsible, some results of trapping experiments, conditions inducing maggot fly attack, treatment of affected sheep, distribution of the fly, and estimates of losses involved. Of flies caught in traps set in normal pastures two species of green-bottle, *Lucilia sericata* and *L. caesar*, have provided rather less than half the total number, of which only *L. sericata* strikes sheep.

Observations on the nutrition of maggots of Australian blow-flies, M. J. MACKERRAS and M. R. FRENEY (*Jour. Expt. Biol.*, 10 (1933), No. 3, pp. 237–246).—In studies conducted by the Division of Economic Entomology at Canberra, Australia, larvae of *Lucilia cuprina* and *Chrysomya rufifacies* were found to be capable of liquefying and digesting protein media without the intervention of bacteria. “Both species and *L. sericata* secrete tryptic and peptic enzymes, and at least *L. cuprina* does so from the moment of hatching. Trypsin is more abundant than peptase. Predatory activity, though a normal habit of *C. rufifacies*, is not necessary for any of these species and did not occur in the masses of *Lucilia* larvae used for extraction of the enzymes, although they were kept for periods up to 24 hr. without food.

“Partial development of larvae occurred in sheep dung, feces-stained wool, and in the products of keratin hydrolysis. Complete development took place in wool containing a gummy crust of dried exudate and in some samples of feces-stained wool. Some of the samples of feces-stained wool and those containing a crust have been demonstrated serologically by Dr. I. M. Mackerras to have an increased content of soluble sheep protein as compared with normal wool. A marked increase of soluble protein has been demonstrated in struck wool both chemically and serologically.

“Moisture, warmth, shelter, aeration are essential physical conditions for larval development. In addition, an alkaline reaction is relatively favorable and an acid reaction relatively unfavorable.”

A catalogue of the Carabidae of Sumatra, H. E. ANDREWES (*Tijdschr. Ent.*, 76 (1933), No. 4, pp. 319–382).—A total of 412 forms from the main island of Sumatra are listed, of which 125 are recognized for the first time. The catalog includes an index of synonymous and subordinate generic names and an index of varieties and synonymous specific names.

The feeding habits of the sinuate pear borer in relation to control practices, H. GLASGOW (*New York State Sta. Bul.* 648 (1934), pp. 31, figs. 15).—The author's studies of the sinuate pear tree borer, one of the most serious insect enemies of the pear in this country and certain parts of Europe, have shown that it feeds readily in the adult stage on pear foliage as well as on that of certain other fruit trees. In feeding, the beetle does not seem to be greatly repelled by the presence of arsenical spray residues on foliage. After feeding on such sprayed foliage for a time, the females ordinarily cease both feeding and egg laying and generally die within a few days.

"Based on these findings, orchard tests as well as the experience of practical growers indicate that the insect may be successfully controlled in pear plantings by two applications of a lead arsenate spray, using the arsenical at the rate of 4 or 5 lb. in 100 gal. The first spray should be applied sometime near the tenth of June, followed by a second approximately 2 weeks later."

The coffee stem borer (*Xylotrechus quadripes* Chev.), T. V. SUBRAMANIAM (*Mysore Dept. Agr., Ent. Ser. Bul. 11 (1934), pp. [2]+18, pls. 8*).—A report of a study of the biology and control of a borer known in south India as the "white borer", which is by far the most important insect enemy of coffee in Mysore.

The influence of forested areas on pea field populations of *Bruchus pisorum* L. (Coleoptera, Bruchidae), C. WAKELAND (*Jour. Econ. Ent., 27 (1934), No. 5, pp. 981-986, figs. 3*).—The data in this contribution from the Idaho Experiment Station are based upon observations during a 3-yr. period in the Palouse region of northern Idaho and eastern Washington, and were secured through extensive field sweepings of growing pea vines. The results of the study, the details of which are presented in table and graph form, show that forested areas rather than higher elevations affect field populations of the pea weevil.

Report on alfalfa weevil investigation in California, A. E. MICHELbacher and E. O. ESSIG (*Jour. Econ. Ent., 27 (1934), No. 5, pp. 960-966*).—The authors report that in general throughout the entire range of the alfalfa weevil in middle California little damage has been done. The investigations thus far have led to the conclusion that the pest can be held in check without resorting to poisonous sprays or dusts. The weevil has spread very slowly since its discovery on May 12, 1932, in middle California, in some places there having been little or no extension of the infested area.

The effect of subfreezing temperatures on the mango weevil, O. C. McBRIDE and A. C. MASON (*Jour. Econ. Ent., 27 (1934), No. 5, pp. 902-907*).—The authors have found that the mango weevil, though living normally under more equable temperature conditions, exhibits cold-hardiness characteristics similar in many respects to those insects in the Temperate Zone. "Practical measures in low-temperature control necessitate exposures sufficient to be fatal to the most hardy individuals. The results indicate that this point is attained after 5 days' exposure at 10° F. and after 25 to 30 days' exposure at 20°. Fifty days' exposure at 30° failed to result in complete mortality."

Relation between the nectar concentration in fruit blossoms and the visits of honeybees, G. H. VANSELL (*Jour. Econ. Ent., 27 (1934), No. 5, pp. 943-945*).—Information is presented regarding the variability in sugar content of nectars, based upon measurements made with an Abbé refractometer equipped for direct sugar reading. The sugar concentration of seven fruit nectars and the variation in plum nectar concentration at four periods in one day at Davis, Calif., are recorded in accompanying tables.

Under field conditions at Davis and Camino, Calif., deciduous fruit nectar with less than 5 percent of sugar was not attractive to bees. Under some other set of conditions the minimum concentration for attractiveness would probably be quite different. Frequently in the early morning, when nectar concentration is low, bees visit blossoms for pollen only, but as the day advances nectar gathering becomes their chief or sole interest. Throughout these studies Bartlett pear seemed to offer no attraction as a source of nectar. Although bees were abundant on these blossoms each morning, they became scarce as the concentration of nectar in apricot or plum increased. Observers recording all the insect visitors to certain Bartlett trees found that, when nectar was avail-

able outside the pear orchard, 81 percent of the honeybees on pear arrived before 11 o'clock in the morning. Field counts of the bees' visits to the blossoms have shown that concentration of the nectar sugar is the chief factor involved in determining which species or variety the honeybee will work most freely for nectar.

The buffering power of the contents of the ventriculus of the honeybee and its effect upon the toxicity of arsenic, W. M. HOSKINS and A. S. HARRISON (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 924-942, figs. 4).—This subject is dealt with under the headings of methods and results of toxicity experiments, normal pH of contents of digestive tract and of body fluid of the honeybee, the buffering power of the contents of the ventriculus, lethal dose of arsenic and comparison with other insects, phosphate in bee blood and in excreta, buffering power of ventricular contents, and nature of the unknown buffer. A list is given of 28 references to the literature cited.

Hive-bees do not necessarily sacrifice their lives when they sting, J. G. MYERS (*Nature [London]*, 134 (1934), No. 3382, p. 290).—The author refers briefly to experiments that have led to the conclusion that there is little ground for the belief that worker bees sacrifice themselves when stinging other insects, or that they are any more handicapped than wasps in defending their nests from such enemies, or that they can sting only once.

Bumblebees and their ways, O. E. PLATH (*New York: Macmillan Co.*, 1934, pp. XVI+201, pls. 11, figs. 20).—A foreword to this work by W. M. Wheeler is followed by a brief preface, in which it is announced that the greater part of this volume consists of material not heretofore published, and an introduction of 6 pages. The several chapters deal with the founding of a colony (pp. 7-14), the bumblebee colony in midsummer (pp. 15-24), the climax in the development of the colony (pp. 25-33), *Psithyrus*, the "cuckoo" bumblebee (pp. 34-45), additional observations on *Psithyrus* (pp. 46-54), commensals, parasites, and predators (pp. 55-68), protection and defense of nest and brood (pp. 69-77), the bumblebee "trumpeter" (pp. 78-84), hibernation (pp. 85-95), rearing of colonies in artificial nests (pp. 96-104), finding and transferring of colonies (pp. 105-112), the economic importance of bumblebees (pp. 113-118), and classification based on behavior (pp. 119-131). An appendix giving a detailed account of the common North American species is included (pp. 133-176), as are a bibliography of 18 pages and a subject index.

Some methods for shipping, feeding, and rearing fruit-fly parasites, A. C. MASON (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 891-897).—This contribution records the results of studies of methods of shipping, feeding, and rearing Mediterranean fruit fly parasites (*Opius humilis* Silv., *Diachasma tryoni* Cam., *D. fullawayi* Silv., and *Tetrastichus giffardianus* Silv.) conducted in Hawaii. The methods described are said to have been successfully used with several consignments of adult parasites sent from Hawaii to California, the mortality in some cases having been less than 10 percent.

"At room temperatures adult parasites can be kept alive for several weeks when provided with proper food. They are able to withstand refrigeration at 44° to 50° F. for 10 days without food or for many weeks if removed from the cold room to room temperatures and fed at intervals of 6 to 10 days. This makes possible their shipment with little care or expense en route provided suitable refrigeration is available. Parasitized pupae can be held at 55° to 60° for 35 to 50 days before any emergence takes place and with little mortality. Storage at ordinary food refrigeration temperatures (36° to 41°) will prove fatal to a large percentage of both pupae and adults after a few days. . . . Similarly, living adults have been introduced into Spain from Hawaii by using

cold storage holding on ships together with air transportation across the continent. Several successful shipments of parasitized fruit fly puparia have been sent to Australia."

Anarhopus sydneyensis Timb., an encyrtid parasite of *Pseudococcus longispinus* (Targ.), recently introduced into California from Australia, H. COMPERE and S. E. FLANDERS (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 966-973, figs. 2).—This contribution from the California Citrus Experiment Station relates to an encyrtid parasite of the long-tailed mealybug, introduced from New South Wales and first colonized on March 6, 1934.

Descriptions of some new species of Chalcidoidea from Cuba and Puerto Rico, A. B. GAHAN (*Mem. Soc. Cubana Hist. Nat. "Felipe Poey"*, 8 (1934), No. 3, pp. 125-134).—The six species of Chalcidoidea described from the West Indies are of economic importance, namely, *Arachnophaga albolinea*, reared from the pupae of the dipteran *Argyrophylax albincisa* Wied., which parasitizes the pyralid *Lamprosema indicata* Fab. infesting lima beans; *Anastatus scutellatus*, reared from eggs of Tettigoniidae; *A. diversus*, reared from eggs of a pentatomid; *Spilochalcis rufa*, reared from *Alarodia* sp. and *Leucophobetron argentiflua* Hübn.; and *Secodella pallidiscapus*, reared from *Lonchaea bruneri* Malloch, all from Cuba, and *Anastatus viridicaput*, reared from eggs of a mantid in Puerto Rico.

The European red-mite in New Zealand (*Paratetranychus pilosus* Can. and Fanz.), W. COTTIER (*New Zeal. Jour. Sci. and Technol.*, 16 (1934), No. 1, pp. 39-56, figs. 8).—A report of extended studies of this important enemy of deciduous fruit trees in New Zealand, particularly of its biology, is presented. Of four natural enemies found in the Dominion, only one, *Scymnus* sp. near *S. minutulus* Brn., is considered to be of any importance.

The snake mite (*Ophionyssus serpantium* Hirst), C. R. SCHROEDER (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 1004-1014, figs. 3).—This is an account of observations of the biology of the common snake mite *O. serpantium*. An aqueous solution of derris root (rotenone acetone extract) is said to be entirely satisfactory as an acaricide for dipping snakes.

ANIMAL PRODUCTION

[Studies with livestock in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 33 (1932), pp. 46-57, 120-123).—The following papers were presented at the thirty-third annual convention of the Association of Southern Agricultural Workers held at Birmingham, Ala., February 2-4, 1932: Place of Livestock on Southern Farms, by E. H. Hostetler (p. 46); A Comparison of Rations for Fattening Steer Calves, by W. L. Blizzard (pp. 46-48); The Challenge of Increased Opportunity, by E. W. Sheets (pp. 48, 49); Forage Crops for Hogs, by F. W. Burns (pp. 49, 50); Self-feeding vs. Limited Feeding of Hogs on Southern Pastures, by S. W. Greene (pp. 50, 51); Blackstrap Molasses as a Feed for Fattening Steers and Farm Work Mules, by M. G. Snell (p. 51); Should Southern Farmers Grow Yellow Corn for Feeding?, by F. R. Edwards (pp. 51, 52); The Development of an Extension Meat Program, by K. F. Warner (p. 52); Production of Feeder Calves, by R. E. Aldrich (p. 53); Use of Brahman Sires in Southern Louisiana, by C. I. Bray (pp. 54, 55); A Nutritional Anemia in Cattle: Its Economic Importance, by A. L. Shealy, R. B. Becker, and W. M. Neal (p. 55); Feeding Demonstrations and Their Effect on Methods of Livestock Production, by L. V. Starkey (pp. 55, 56); The Present Status of the Mineral Feeding Problem, by G. Bohstedt (p. 56); Parasites of Cattle, by C. A. Cary (p. 57); The Effect of Antecedent Egg Production upon

the Hatchability of Eggs, by C. W. Upp (pp. 120, 121); Mineral Requirements for Chicks, by R. M. Sherwood (pp. 121, 122); and The Effect of Varying the Amounts of Protein in the Poultry Ration on Chick Growth and Subsequent Egg Production, by L. Morris, R. B. Thompson, and U. G. Heller (pp. 122, 123).

[**Experiments with livestock in Florida**] (*Florida Sta. Rpt. 1933*, pp. 31, 32, 60, 61, 63, 64, 65, 188-190).—Results obtained in tests with beef cattle are reported on the carrying capacity and forage value of pasture grasses, by G. E. Ritchey and W. E. Stokes; the value of grazing for fattening cattle in beef production, and improving the size and quality of native cattle by use of purebred bulls of various breeds, both by A. L. Shealy; and dual purpose and beef cattle investigations in the Everglades, by R. W. Kidder.

In swine studies data were obtained on comparisons of various grazing crops with dry lot feeding for pork production, and fattening fall pigs for spring market, both by Shealy; and swine field experiments, by W. W. Henley.

Experiments with poultry yielded data on a comparison of various poultry vermifuges for their efficacy and effect on egg production, and the effect of feeding crotalaria seed to chickens and other birds, by E. F. Thomas.

[**Experiments with livestock in Hawaii**] (*Hawaii Sta. Rpt. 1933*, pp. 21, 22, 23).—Tests were conducted with swine to obtain information on the feeding value of bananas and papayas, to compare sugarcane molasses and barley, and to determine the effectiveness of sprouted oats for sows that were poor breeders.

In tests with poultry results were reported on raising turkeys in confinement, sugarcane molasses as a poultry feed, tree kale for poultry, hatching chicks throughout the year, batteries for laying and breeding stock, and artificial illumination for laying hens.

[**Experiments with livestock in Utah**] (*Utah Sta. Bul. 250 (1934)*, pp. 29-31, 32, 33).—Tests with sheep yielded information on corn and cottonseed cake as concentrated supplements for wintering sheep on desert ranges in Utah, by E. J. Maynard; lamb fattening rations for southern Utah, by Maynard; effect of winter feed and shelter v. open range wintering on the quality and quantity of wool from Utah range ewes, relative market value of crossbred lambs from crosses of purebred Hampshire, Suffolk, Rambouillet, and Corriedale rams on Utah range ewes, and comparative values of fleeces from types B and C Rambouillet ewes, all by Esplin.

With beef cattle results were obtained in studies on phosphorus supplements for sugar beet byproduct rations for cattle, by Maynard and J. E. Greaves; effect of calcium-phosphorus ratio on rate and economy of grain in fattening beef calves, by Maynard; winter maintenance of range calves, by Maynard and B. F. Hulme; and beef cattle tests at the Panguitch Livestock Substation, by Hulme.

Results with milk products in swine fattening rations were reported by H. H. Smith.

In poultry studies results were obtained on breeding for egg production and poultry-feeding tests, both by B. Alder.

The utilization of energy producing nutriment and protein as affected by individual nutrient deficiencies.—I, The effects of cystine deficiency, R. W. SWIFT, O. J. KAHLBERG, L. VORIS, and E. B. FORBES (*Jour. Nutrition*, 8 (1934), No. 2, pp. 197-219, figs. 2).—The object of this investigation at the Pennsylvania Institute of Animal Nutrition was to compare two diets of the same gross energy value, and of the same composition, except for a difference in the quantity of the amino acid cystine present. Twenty young growing rats were fed by the paired-feeding method for 14 weeks on diets containing 8

percent of protein from skim milk powder. One of the diets was supplemented with 0.24 percent of *l*-cystine.

It was found that a deficiency of cystine depressed the appetite, but apparently had no effect on the digestibility of the food protein. The rats receiving the added cystine made greater growth and stored 10.8 percent more energy and 24.4 percent more nitrogen than the controls. During the test the rats receiving cystine stored on the average 40.4 Calories more than did the controls. This gain was accompanied by 29 Calories less loss in heat, 8.6 Calories less loss in feces, and 2.8 Calories less loss in urine. These differences in energy loss, when related to the gross energy of the diets, were 0.1 percent as urine, 0.3 percent as feces, and 1 percent as heat. The ratio of carbon to nitrogen in the urine was approximately 2 for both groups. This unusual value was due to the low proportion of protein in the diet.

An adaptation of the paired-feeding method for the determination of the supplementary value of proteins. J. R. HAAG (*Jour. Nutrition*, 8 (1934), No. 2, pp. 235-238).—In this paper from the Oregon Experiment Station the author describes an adaptation of the paired-feeding idea to a study of the supplementary value between the proteins of alfalfa leaf meal and those of wheat bran. The method followed was to match three rats from the same litter for weight and sex. One of the rats was fed a ration containing alfalfa leaf meal as the source of protein, another wheat bran, and the third equal parts of these feeds as the source of protein.

Preliminary results indicate that this method will prove useful in studies on the nutritive value of the proteins of bulky vegetables and forage crops, that wheat bran proteins are superior to those of alfalfa leaf meal, that this superiority is not due to differences in apparent digestibility, and that there is apparently a slight supplementary effect between the proteins of the two feeds.

Commercial feeding stuffs, 1933-34. J. M. BARTLETT (*Maine Sta. Off. Insp.* 152 (1934), pp. 29-76).—This is the usual report of the guaranteed and found analyses of 1,027 samples of feeding stuffs collected for official inspection during the year ended June 30, 1934 (*E. S. R.*, 70, p. 514.)

Beef cattle production in Georgia. F. R. EDWARDS and Z. A. MASSEY (*Georgia Sta. Bul.* 184 (1934), pp. 60, figs. 27).—This is a popular bulletin dealing with the history of beef production in Georgia, the breeds of beef cattle, breeding, management of cows and calves, and fattening cattle for market.

The blood chemistry of swine.—I, Blood changes following the ingestion of glucose. D. F. EVELETH (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 559-563).—In this study it was found that the blood sugar of fasting pigs weighing from 40 to 60 lb. varied between 40 and 74 mg percent. Following fasting a dose of 0.8 g of glucose dissolved in water to make a 60 percent solution was given by means of a stomach tube. In only one case did the blood sugar go higher than 300 mg percent after the ingestion of glucose. Individual pigs showed some variation in the rate of glucose metabolism. In some cases the maximum concentration of blood sugar occurred in 30 min., while in others the blood sugar continued to increase for 1 hr. or more. The peak of the amino acid curve usually occurred about 30 min. after the peak of the sugar curve. Urea usually increased slightly, but the average values showed practically no change. Inorganic phosphorus decreased to a definite low point about 30 min. after the peak of the sugar curve. Urea and calcium in general tended to rise following the ingestion of glucose with a subsequent decrease.

The use of the method of partial regression in the analysis of comparative feeding trial data, Part II, E. W. CRAMPTON and J. W. HOPKINS (*Jour. Nutrition*, 8 (1934), No. 3, pp. 329-339).—Continuing these studies at Macdonald College, Canada (E. S. R., 72, p. 86), the experimental feeding trials were extended and further examples of the application of the relationships between initial weight and feed consumption of swine of four different ages and their performance in experimental feeding trials are given.

In all age groups there was a highly significant relation between final weight and feed eaten. The increase in final weight per unit of additional feed consumed decreased with advancing age. The final weight attained also was influenced by the initial weight of the pig except for young pigs fed to market weight.

Identical results were obtained whether gains or final weights were corrected for variations in feed consumption by means of an appropriate regression formula. On this basis the usual calculation of gains leads to no increase in the accuracy of the data.

Feeding the young pig, E. H. HUGHES and H. HART (*California Sta. Bul.* 578. (1934), pp. 16).—A series of experiments was undertaken to compound diets, without using milk products, that would successfully carry a pig from weaning to 75 lb. in weight and to study the effects of these early diets on subsequent growth, development, and fattening of the animal, especially when the fattening ration contained barley.

In this work young growing and fattening pigs having access to pasture gained more rapidly than did similar pigs in dry lot. The evidence suggested that the vitamin A in pasture plants was an important factor in the greater gains. Pigs that had been on pasture until they reached 75 lb. in weight gained more rapidly during a fattening period in dry lot than did those that had not been on pasture. Pigs fed through the summer and early fall required less feed per unit of gain than did those fed through the late fall and winter months. The feed consumption per unit of gain and the rate of gain was less for pigs weighing 30 to 75 lb. than for pigs weighing 75 to 200 lb. In these tests thrifty, rapidly growing pigs were produced on locally grown feeds containing the necessary nutrients and accessory factors.

Modern horse management, R. S. TIMMIS (*London and Toronto: Cassell and Co.* [1934], new and rev. ed., pp. XXIII+325, pls. 32, figs. 18).—This is a new and revised edition of the treatise previously noted (E. S. R., 34, p. 268).

Pineapple bran as a feed for mules, L. A. HENKE (*Hawaii Sta., Anim. Husb. Div. Prog. Notes* No. 7 (1934), pp. 8).—In this test 18 mules were divided into two lots and fed so that one mule of each team received the "barley" ration (56 percent barley, 28 percent pineapple bran) and the other the "pineapple bran" ration (53 percent pineapple bran, 27 percent barley) at the rate of 14 lb. per head daily for 162 days. In addition each mule received 50 lb. of cut cane tops, over which were poured 4 lb. of cane molasses.

During the test the "barley" mules made an average gain of 35 lb. and the "pineapple bran" mules 40 lb. per head. The feed consumption was practically the same in both lots. The cost of the pineapple bran ration in this test was 2.5 ct. less per mule per day than the barley ration.

The vitamin D requirements of growing chicks and laying hens, R. R. MURPHY, J. E. HUNTER, and H. C. KNANDEL (*Pennsylvania Sta. Bul.* 303 (1934), pp. 24, figs. 11).—The first sentence of the abstract of this bulletin (E. S. R., 71, p. 521) should read, "The results of tests are reported in which from 0 to ½ percent of a fortified cod-liver oil was added to an all-mash ration for 2,000 Single Comb White Leghorn chicks raised to 24 weeks of age in confinement and for about 500 of the pullets the following year."

Poultry feeding, housing, and lighting experiments at the Wyoming Experiment Station, M. O. NORTH (*Wyoming Sta. Bul.* 203 (1934), pp. 52, figs. 4).—The results of several studies are noted.

Cereal grains for egg production and egg quality.—In this test it was noted that pullets laid equally well and maintained normal health on mash and grain rations containing from 65 to 70 percent of either yellow or white corn, wheat, oats, rye, or barley. The birds in the oats lot consumed a larger proportion of mash than did those in the other lots. No differences in porosity, breaking strength, thickness of shell, and percentage of shell to total egg were noted. No ration produced any measurable differences in percentage of total solids, of proteins, or in odors and flavors. The eggs in the rye lot had a lower ratio of thick to thin white and a lower yolk index. Barley tended to produce a lower ratio of thick to thin white, yellow corn tended to deepen the yolk color, and wheat to increase the number of large islands of fat.

Poultry housing and lighting for egg production.—It was found that a straw loft and straw pack between the studdings of a poultry house were efficient for protection against extreme variations in temperature. Long-continued cold reduced egg production, but the birds were not greatly affected by sudden drops in temperature of short duration. Continuous dim lighting resulted in both hens and pullets laying more eggs at the season of high prices than bright lights in morning and evening or no lights at all. Feed consumption was approximately the same regardless of the system of lighting or the number of eggs laid, but mortality was higher in the lighted than in the unlighted lots.

Feeding and lighting for egg production.—Birds on a grain and mash ration tended to gain more weight than those fed an all-mash ration. Feed consumption was highest in the grain and mash lots, especially when continuous lights were used. Egg production was about 26 percent higher in lots under continuous lights and fed grain and mash rations than in control lots receiving no extra light and fed either grain and mash or all-mash rations. The continuous lights stimulated egg production during the period of high prices so that there was an increase of about 40 percent in returns from this system of management as compared with the control lots. However, this increased winter production was gained at the expense of spring production. The color of yolks varied more in the grain and mash lots than in the all-mash lots.

The value of rye in the chick ration.—Chick rations in which 20 percent of rye was substituted for other cereal grains were found to be satisfactory. Rations containing as much as 30 percent of rye produced satisfactory growth, but caused such a laxative condition that this level could not be recommended. Adding as much as 40 percent of rye to chick rations did not increase the mortality rate.

Commercial poultry farming, T. B. CHARLES and H. O. STUART (*Danville, Ill.: Interstate Ptg. Co.*, [1934], pp. XVI+436, pls. 2, figs. 193).—This treatise was designed to give the practical poultryman information relative to established and dependable practices on incubation, hatching, brooding, feeding, management, breeding, housing, and disease control of poultry.

Proper handling of eggs on the farm, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen*, 21 (1934), No. 5, pp. 4).—The methods of feeding and housing the flock and the handling, storing on the farm, and marketing of eggs that contribute to the production of a high-quality product are outlined.

Vitamin-A deficiency in turkeys, W. R. HINSHAW and W. E. LLOYD (*Hilgardia [California Sta.]*, 8 (1934), No. 9, pp. 281-304, figs. 10).—These experiments were outlined to determine the possible relation of A avitaminosis to turkey mortality and to ascertain the effect on turkeys of various vitamin A

levels. Bronze turkey poults and White Leghorn chicks were used as experimental animals.

Poults on a vitamin A-free diet from hatching developed definite symptoms of vitamin A deficiency in 25 and 26 days, respectively, in two tests. The chicks did not show these symptoms until the twenty-seventh day. Among poults the first deaths occurred on the thirtieth and thirty-second days, respectively, with 100 percent mortality by the forty-fourth and fortieth days. The first death of chicks occurred on the thirty-fourth day and the last on the fifty-sixth.

The symptoms in poults resembled those of an infectious disease. Xerophthalmia was the principal differential symptom, but caseated pus seldom collected in the eyes. Marked nervousness was noted in the chicks, but not in the poults. Lesions in poults were confined to the mucous membranes of the head, upper digestive tract, respiratory tract, and the bursa of Fabricius. The lesions were similar to but never as numerous as those found in chicks. Tracheitis was occasionally manifested, but deposits of urates in kidneys and ureters seldom occurred in poults.

The mortality with poults on the basal ration supplemented with 1, 2, and 4 percent levels of dehydrated alfalfa leaf meal was 97.6, 66.2, and 54.9 percent, respectively. A level of 8 percent of this meal or freshly cut alfalfa prevented mortality associated with or caused by A avitaminosis. The survival time of turkeys and chickens placed in a pen at the end of 30 weeks and fed the basal ration varied directly with the amount of vitamin A received before the transfer. There was a marked individual resistance to vitamin A deficiency noted during the experiment.

It is concluded that Bronze turkeys required a ration including 8 percent of dehydrated alfalfa leaf meal (containing approximately 130 γ of carotene per gram) for normal growth to 30 weeks of age, while White Leghorn chicks showed no evidence of vitamin A deficiency and made normal growth on 4 percent of this meal.

Rabbit production, F. G. ASHBROOK and C. E. KELLOGG (*U. S. Dept. Agr., Farmers' Bul. 1730 (1934), pp. II+38, figs. 20*).—The essential principles of rabbit production are set forth in this publication, which supersedes Farmers' Bulletin 1519 (E. S. R., 56, p. 597) and Leaflets 4, 15, and 22 (E. S. R., 57, p. 766; 58, p. 584; 59, p. 666).

DAIRY FARMING—DAIRYING

International directory of dairying institutions, A. BRIZI (*Les Institutions de laiterie dans le monde. Roma: Inst. Internatl. Agr., 1934, pp. VIII+437, figs. 16*).—This is an international directory of dairy institutions, showing the personnel and activities of each. The text is printed in both French and English.

[**Studies in dairy husbandry in the Southern States**] (*Assoc. South. Agr. Workers Proc., 33 (1932), pp. 75, 76-83*).—The following papers were presented before the dairy husbandry division at the thirty-third annual convention of the Association of Southern Agricultural Workers held at Birmingham, Ala., February 2-4, 1932: Calcium in the Rations of Dairy Cows, by R. B. Becker and W. M. Neal (p. 75); Bone Meal and Marble Dust as Mineral Supplements to the Dairy Ration, by W. H. Eaton (pp. 75, 76); A Survey of the Cheese Manufacturing Industry in Oklahoma, by J. I. Keith and E. Weaver (pp. 76, 77); Some Factors Affecting the Fat Constants, Flavor, and Texture of Southern Butter, by F. H. Herzer (p. 78); Production Record in Dairy

Shows, by C. E. Wylie (pp. 78, 79); Grain as a Supplement to Dairy Pastures, by R. H. Lush (pp. 79, 80); Forage Crops for Beef and Dairy Cattle, by J. C. Grimes (pp. 80, 81); The Use of Mung Bean Hay in the Ration for Milking Cows, by A. H. Kuhlman and E. Weaver (pp. 82, 83); and Some Results of Feeding Cottonseed Meal to Dairy Cows, by O. C. Copeland (p. 83).

[**Experiments with dairy cattle in Florida**] (*Florida Sta. Rpt. 1933*, pp. 58-60, 63).—In experiments with dairy cattle results were obtained on deficiencies in feeds used in cattle rations and soybean silage for dairy cows, both by R. B. Becker and W. M. Neal; and a study of the feeding value of crotalaria, by Becker, Neal, and A. L. Shealy.

[**Experiments with dairy cattle in Hawaii**] (*Hawaii Sta. Rpt. 1933*, pp. 20, 21).—Studies of dairy cattle yielded information on the protein requirements of the heavy milking cows, the feeding value of green pigeonpea tops, pineapple bran as a supplement to concentrates and roughages, sugarcane molasses for dairy cows, and feeding sprouted oats to irregularly breeding animals.

Proved sires and partially proved dams in breeding dairy cattle for production, A. C. DAHLBERG (*New York State Sta. Bul. 645 (1934)*, pp. 30, figs. 5).—The breeding program for the station Jersey herd from 1900 to 1921 is explained. Under this system the herd production per year varied from 300 to 325 lb. of butterfat. The system was based on the selection of bull calves from good dairy cows in the herds of successful breeders and using these bulls until they were 4 or 5 yr. of age. Since 1921 bull calves have been selected from excellent herds, with special attention given to the progeny of their immediate ancestors. The sires that proved good, together with their daughters, have been used for breeding throughout their lives. Under this system the average production of butterfat has risen to 423 lb. All the progeny of one low-producing strain of female breeding were slaughtered, and the blood of a high-producing strain was intensified. Consideration was given also to the selection of bull calves by pedigree and to the proper evaluation of a proved sire in a given herd.

Proceedings of the twenty-sixth annual convention of the International Association of Milk Dealers: Plant and laboratory sections (*Internatl. Assoc. Milk Dealers, Proc.*, 26 (1933), *Plant Sect.*, pp. 72; *Lab. Sect.*, pp. 225, figs. 50).—At this meeting (E. S. R., 70, p. 89) held in Chicago, Ill., September 21-23, 1933, the following papers were among those presented before the plant section: Plate Type versus Surface and Internal Tube Heat Exchangers, by R. N. Slawson (pp. 25-34); Milk Cooling Mediums, by T. L. Kimball (pp. 34-38); How Can Scratching of Bottles Be Reduced? (a) Effects of Plant Equipment, Route Handling, and Bottle Design on Bottle Scratching, by M. Van Antwerpen (pp. 54-60); (b) Effect of Composition of Glass and Temperature and Strength of Alkali Solutions on Bottle Scratching, Together with Discussion of Methods Proposed to Measure Scratchability, by H. A. Trebler and J. H. Shrader (pp. 60-68); and Alkali Drip and Broken Glass in Washed Bottles, by C. R. Myer, Jr. (pp. 68-72).

The following papers were presented before the laboratory section: The Effect of Pasteurization on Some of the Nutritive Properties of Milk, by W. E. Krauss (pp. 3-9); High-Temperature, Short-Time Holding Pasteurization in the United States, by M. W. Yale (pp. 10-59); Is the Pasteurizability of Raw Milk Adequately Determined by the Standard Plate Count? by B. Davies (pp. 59-72); Methods for the Microbiological Analysis of Butter, by E. H. Parfitt (pp. 73-81); Further Studies on Weigh Tank Test Variations, by D. H. Bailey, J. W. Mitten, and F. M. Twining (pp. 81-95); Report of the Laboratory Methods Committee on Accuracy of Sampling for Fat Tests at the Weigh Can, by A. J. Powers (pp. 95-159); Results Obtained from Feeding *Acidophilus*

Milk, by C. N. Stark, R. Gordon, J. C. Mauer, L. R. Curtis, and J. H. Schubert (pp. 160-164); Factors Affecting the Mineral Nutritional Properties of Milk, by L. A. Maynard (pp. 165-171); Physical and Chemical Effects of Homogenization on Milk, by G. M. Trout (pp. 199-220); and Heat Transfer through Pasteurizer Linings, by A. C. Dahlberg and J. C. Marquardt (pp. 220-225).

The effect of heat and chemical sterilization on the rubber parts of milking machines, J. L. HENDERSON, C. L. ROADHOUSE, and A. FOLGER (*Jour. Dairy Sci.*, 17 (1934), No. 7, pp. 475-482, figs. 2).—The California Experiment Station undertook a study to investigate the effect of heat and of the common chemical sterilizing agents on the period of usefulness of the rubber parts of milking machines. Four units of a milking machine of one manufacturer were used for a period of 2 yr. to obtain the data reported.

The most satisfactory method of heat sterilization was by using water at 185° F. and leaving the rubber parts in the water for 20 min. This method did not materially affect the life of the rubber parts when compared with heating at 170° for 20 min. There was evidence that thermophilic bacteria developed when rubber parts were heated to 170° for 20 min. or left in the water to gradually cool until the next milking.

Chlorine in solutions of 200 p. p. m. or sodium hydroxide in 0.3 and 0.5 percent solutions gave bacterial counts somewhat higher than sterilizing at 185°, but was effective in controlling thermophilic organisms. The life of the rubber parts was approximately the same with both chemical sterilizers. The life of teat cup liners was about 33 percent shorter with the heat treatments than with the chemical treatments. The length of service had more influence in reducing the life of rubbers than did cow-hours of operation in chlorine sterilization.

Rate of growth and acid production of *Streptococcus lactis*, J. M. SHERMAN and H. M. HODGE (*Jour. Dairy Sci.*, 17 (1934), No. 7, pp. 497-500).—Investigations at the [New York] Cornell Experiment Station showed that by segregating the fast-growing strains of *S. lactis* from those which grew more slowly in stock cultures it was possible to demonstrate that slow growth was associated with greater acid tolerance.

The differentiation of *Streptococcus lactis* from *Streptococcus fecalis*, J. M. SHERMAN and P. STARK (*Jour. Dairy Sci.*, 17 (1934), No. 8, pp. 525, 526).—In this paper from the [New York] Cornell Experiment Station the authors show that *S. lactis* may be readily differentiated from *S. fecalis* by its lower maximum growth temperature, by a lower thermal death point, by a lower alkaline limit for growth, and by a lower tolerance for sodium chloride.

Influence of homogenization on the curd tension of milk, D. R. THEOPHILUS, H. C. HANSEN, and M. B. SPENCER (*Jour. Dairy Sci.*, 17 (1934), No. 7, pp. 519-524, figs. 2).—The Idaho Experiment Station undertook studies to determine the relationship that exists between the pressure of homogenization and the curd tension of milk. Samples of the same milk were heated to 130° F. and then homogenized at selected pressures on either single- or two-stage homogenizers.

Homogenizing pressures of 500, 1,000, and 2,000 lb. reduced the curd tension of milk approximately 25, 46, and 53 percent, respectively. Both types of homogenization were equally effective in reducing curd tension. The higher the original curd tension of the milk, the greater was the percentage reduction after homogenization. It is pointed out that homogenization may be used to reduce high-curd tension milk to a lower curd tension or to lower still further the curd tension of soft-curd milk.

The influence of fluorine ingestion upon the nutritional qualities of milk, P. H. PHILLIPS, E. B. HART, and G. BOHSTEDT (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 123-134, figs. 2).—The Wisconsin Experiment Station undertook a series of studies to determine whether or not the nutritional qualities of milk were influenced by different levels of fluorine intake, such as might be encountered in ordinary feeding. Rats were fed diets furnishing as low as 1 to 2 parts of fluorine in 10,000,000.

Mineralized milk samples from individual cows caused variable milk consumption with rats, but the cause of the differences was not clear. No difference was observed in the biological reaction of rats fed normal milk as compared with those fed milk from cows receiving an added source of fluorine. The range of fluorine in normal milk was from 0.05 to 0.25 mg per liter, with an average of 0.138 mg. This was not greatly different than from that of milk from cows fed added fluorine, and the lactation or period of lactation was without effect on the fluorine content. Adding fluorine to milk diets resulted in a higher residual fluorine in the body ash, but the storage was not proportional to the intake. No difference was demonstrated between the residual fluorine of the body ash of rats fed normal milk and those fed milk from cows receiving an added source of fluorine. Diets with traces of fluorine ranging from 4.5 to 132 μ g per rat per day had no toxic effect on rats.

It is concluded that it is not easy to influence the fluorine content of milk by dietary means, and that fluorine in concentrations greater than 1 part in 10,000,000 has no essential function in the metabolism of the rat.

Irradiated milk: The influence of fat content and time of exposure on the antirachitic potency, G. C. SUPPLEE, G. E. FLANIGAN and R. C. BENDER (*Jour. Dairy Sci.*, 17 (1934), No. 7, pp. 483-487).—Continuing this study (E. S. R., 72, p. 245), tests were undertaken to obtain further information regarding the antirachitic activation as influenced by the character and thickness of the milk film, the fat content, and the time of exposure.

A momentary exposure of less than 2 sec. activated milk of normal fat content to substantially its maximum degree if a suitable intensity of ultraviolet radiation was applied to films of suitable thickness and flow characteristics. The fat content had a limited effect upon the rate at which antirachitic properties were produced in milk by direct radiation. Milks with little or no butterfat were activated to a substantial degree, but the potency finally obtained was not reached as quickly as in milks with higher fat contents. The degree of potency attainable in milk with the larger amounts of fat did not increase in proportion to the amount of fat present.

Irradiated milk: Characteristics of the flowing film required for optimum efficiency of antirachitic activation, G. C. SUPPLEE and M. J. DORCAS (*Jour. Dairy Sci.*, 17 (1934) No. 8, pp. 527-531, figs. 2).—Continuing the above study, the data presented in this paper deal with the influence of film characteristics on the efficiency of utilization of the activating energy during the irradiation of milk.

It was shown that the flow of milk films over smooth vertical surfaces by gravity can be differentiated as films with dominant smooth flow characteristics or dominant turbulent flow characteristics. Milk was activated to a 2+ degree of calcification, as determined by standard assay procedures, under a wide range of properly coordinated conditions involving film capacity, film thickness, and distance of film travel, within a momentary period of exposure. The irreducible minimum of time required to give the specified degree of activation in these tests was from 0.75 to 1.3 sec. Exposure periods of 2.7 sec.

gave the same degree of activation under conditions which allowed a marked increase in the amount of milk that could be activated in a unit of time.

The effect of pasteurization upon the vitamin C content of milk, C. G. KING and W. A. WAUGH (*Jour. Dairy Sci.*, 17 (1934), No. 7, pp. 489-496, figs. 2).—This investigation was planned to determine the vitamin C content of representative western Pennsylvania market milk as received at the pasteurizing plant and the effect on this content of pasteurization by three different methods.

There was no significant destruction of vitamin C in milk pasteurized by the Electropure or Stam Vik (flash) methods when all-aluminum equipment was used. This was attributed to the very short heating time, method of heating, protection from atmospheric oxidation during heating, and minimum exposure to metals which catalyze oxidation. Pasteurizing samples of the same milk either in the laboratory or in a commercial vat at 143° to 145° F. for 30 min. resulted in a marked destruction of vitamin C. The means of conserving the natural vitamin C content of milk during pasteurization is discussed.

Cream flavors and viscosity as affected by the temperature of pasteurization and of the heating medium, J. C. MARQUARDT and A. C. DAHLBERG (*New York State Sta. Tech. Bul.* 224 (1934), pp. 16, figs. 7).—This study was undertaken to determine the influence of the temperature of pasteurization and of the heating medium on the flavor and viscosity of cream pasteurized in stainless steel and glass-lined vats.

When 40-percent cream was heated to 150° F. with a heating medium at 210° or above in either vat, a heated flavor was produced that tended to disappear after storage at 40° for 48 hr. Heating similar cream to 150° with water at 180° produced a heated flavor in 75 percent of the tests, but this flavor always disappeared after storing for 24 hr. at 40°. Heating to 143.5° with water at 180° or lower produced no heated flavor, but if the cream was heated to this temperature in a steel-lined vat with water at 210° a heated flavor was produced. This flavor, however, disappeared after storage. The presence of a heat-produced film on the wall of either the steel- or glass-lined vat did not bring about a heated flavor in the cream but markedly decreased the rate of heat transfer.

This and the preceding study (E. S. R., 71, p. 524) showed that a heated or cooked flavor was more readily imparted to cream than to milk. Flowing steam not under pressure or water at 210° for the glass-lined pasteurizer and water at 180° for the stainless-steel vat were apparently the hottest heating mediums that could be used without producing the off flavor. Washing pasteurizers between batches of cream was essential to maximum heat transfer. Pasteurization at 150° reduced the viscosity of freshly pasteurized or aged pasteurized cream more than heating at 143.5°. The viscosity of pasteurized cream tended to increase for 48 hr. at 40°. The heated flavor was associated to a greater extent with the fat of cream than with the serum solids, although both were affected.

The relation of the composition of butterfat to the churnability of cream, S. T. COULTER and W. B. COMBS (*Jour. Dairy Sci.*, 17 (1934), No. 8, pp. 551-557, figs. 7).—The Minnesota Experiment Station presents data which indicate a seasonal variation in the fat content of buttermilk. The variation appeared to be associated with the seasonal fluctuations in the iodine number and thus with the changes in the hardness of the butterfat. It was found that the churning time of cream from the same cows was prolonged when there was an increase in the hardness of the butterfat, and that the fat content of the buttermilk decreased with an increase in the time required for churning.

The acidity of cream and the keeping quality of butter made from it, with special reference to the neutralization of cream, W. J. WILEY (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 1, pp. 14-25).—In this article the author reviews the more important of the published results on the acidity of cream and the keeping quality of butter prepared from it. Cream neutralization is briefly reviewed, and some theoretical aspects of the subject are discussed. The results of the examination of 70 samples of butter for acidity are given, showing the great variation that exists in this respect in good quality butter.

Fat-soluble vitamins.—XXXIX, The influence of breed and diet of cows on the carotene and vitamin A content of butter, C. A. BAUMANN, H. STEENBOCK, W. M. BEESON, and I. W. RUPEL (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 167-176).—Continuing this investigation (E. S. R., 71, p. 134) at the Wisconsin Experiment Station, spectroscopic determinations were made of the vitamin A content of butterfat from cows of different breeds on high and low carotene rations.

On a winter ration the average carotene values ranged from 4.3 μg per gram for Holstein butterfat to 7.8 μg per gram for Guernsey butterfat. The vitamin A values ranged from 5.1 μg per gram for Guernseys to 10.1 for Holsteins. On a green feed ration the average for carotene ranged from 5.5 μg per gram for Ayrshires to 17 for Guernseys, and the vitamin A from 8.5 μg per gram for Guernseys to 15.1 for Holsteins. Variations of as much as 100 percent were found between individuals of the same breed. Increasing the carotene intake of the cow was followed by an increase in both carotene and vitamin A content of the butterfat. It is concluded that 3.3 percent of the vitamin A ingested on a low carotene ration was recovered in the milk, but only 1.3 percent was recovered from a high carotene ration.

The relation between the hardness of butter and butterfat and the iodine number of the butterfat, S. T. COULTER and O. J. HILL (*Jour. Dairy Sci.*, 17 (1934), No. 8, pp. 543-550, figs. 4).—Using an apparatus similar to that used for measuring the body of cheese (E. S. R., 64, p. 172), the Minnesota Experiment Station made a study of the relation between the chemical constants of butterfat and the hardness of the butterfat and butter.

When a standard churning and working procedure was used, it was found that the hardness of butter was directly proportional to the hardness of the butterfat. Variations in the moisture content of butter had a slight influence on its hardness. Under standard churning and working conditions the moisture content of butter increased with an increase in the iodine number of the butterfat. There was a highly significant correlation between the hardness of the butterfat and its iodine number. Extreme variations in the Reichert-Meissl number of the butterfat could be associated with variations in its hardness. Butterfat from Jersey and Guernsey cows was somewhat firmer than butterfat with the same iodine number from Holstein and Ayrshire cows.

The microbiology of cheese-like flavors in unsalted butter, E. O. HERREID, H. MACY, and W. B. COMBS (*Minnesota Sta. Tech. Bul.* 97 (1934), pp. 64, figs. 3).—These studies were planned to obtain information regarding the underlying causes of cheesy flavors, especially those of the Cheddar type, which occur so frequently in unsalted butter. A bibliography of 123 titles is included.

It was found that in the majority of cases raw cream contained microorganisms capable of producing the cheesy flavor and aromas in unsalted butter. In aseptically drawn milk the types of bacteria present were not important factors in the production of this off flavor. The enzyme galactase was not responsible for the Cheddar cheese type flavor. Pure cultures of the various isolated

species of bacteria were not consistently able to induce the cheesy flavor, while naturally mixed cultures were most consistent in this respect. Artificially mixed cultures produced flavors suggestive of, but not identical with, those produced by naturally occurring mixtures.

Gram-negative, rod types of bacteria predominated in the mixed and pure cultures capable of producing the Cheddar cheese type flavor. This flavor in cream or unsalted butter occurred most typically at temperatures of 10° C. or below. Creamery water supplies were sometimes contaminated with bacteria capable of producing the off flavor, and sterile cream butter may be infected through contact with such water. The plasma of cream contained the substrates necessary for the development of the causative flora producing the cheesy flavors and aromas.

The making of ice-cream, L. R. M. FELTHAM (*London: Heywood & Co., 1934, pp. 165*).—This book contains practical suggestions on the actual making of ice cream.

Gelatin in ice cream specialties and how it should be used, W. S. MUELLER and J. H. FRANSEN (*Ice Cream Trade Jour., 30 (1934), No. 7, pp. 17-19*).—The Massachusetts Experiment Station found that the addition of fruit-flavored gels to ice cream specialties was desirable from the standpoint of attractiveness, palatability, and greater variety. The fruit-flavored gelatin remained clear, even at ice cream storage temperatures, if the correct amount and kind of sugar was used in making the gel. Of the mixtures tested, a gelatin-sugar mixture containing 30 percent cane and 30 percent corn sugar was the most satisfactory.

VETERINARY MEDICINE

A textbook of bacteriology, H. ZINSSER and S. BAYNE-JONES (*New York and London: D. Appleton-Century Co., 1934, 7. ed., rev., pp. XIX+1226, figs. 174*).—A rewritten, revised, and reset edition of the work previously noted (*E. S. R., 50, p. 478*).

The problem of intranuclear inclusions in virus diseases, E. V. COWDREY (*Arch. Path., 18 (1934), No. 4, pp. 527-542*).—It is pointed out that the immediacy of the relation between virus and inclusions is in question. "The viruses may not themselves produce the inclusions. They may merely initiate physicochemical changes that lead to their production in some cases and not in others. There is a chance that these alterations can be brought about without viruses. What the viruses are no one knows. There is danger in assuming that they are all alike. Some may be living agents of a type already familiar, of a type altogether different, while others may be inanimate chemical substances akin perhaps to enzymes."

The inheritance of resistance to bacterial infection in animal species: A review of the published experimental data, A. BRADFORD HILL (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 196 (1934), pp. 71, figs. 2*).—A review presented in connection with a list of 67 references to the literature.

Plants poisonous to livestock, O. A. BEATH, J. H. DRAIZE, and C. S. GILBERT (*Wyoming Sta. Bul. 200 (1934), pp. 84, figs. 56*).—Following a brief general discussion, part 1 of this account deals with plants in which the toxic minerals do not seem to be of special significance (pp. 13-43), part 2 with plants in which the poisonous properties seem to be influenced by the content of toxic minerals (pp. 44-79), based largely on recent studies (*E. S. R., 72, p. 251*), and part 3 with plants which are sometimes poisonous to domestic animals (pp. 80-82).

The sterilization of Protozoa, A. HETHERINGTON (*Biol. Bul.*, 67 (1934), No. 2, pp. 315-321).—A method of sterilization of Protozoa combining the technic of migration with that of washing is presented. This method reduces the number of washings from 10 to 7, increases the efficiency so that a considerable number of animals can be sterilized simultaneously, and greatly simplifies the apparatus required. Briefly, the technic consists in inducing the Protozoa to migrate for some distance in order to separate them from surrounding bacteria, then allowing them to swim about for a period to permit the shedding of attached bacteria.

The influence of starvation on anthelmintic efficiency, I. CLUNIES ROSS and H. McL. GORDON (*Aust. Vet. Jour.*, 10 (1934), No. 4, pp. 135-142).—The authors have found no evidence that prior starvation for 24 hr. in any way increases anthelmintic efficiency of copper sulfate or carbon tetrachloride administered against *Haemonchus contortus*.

[Report of work in animal pathology by the Utah Station] (*Utah Sta. Bul.* 250 (1934), pp. 33-36).—The work of the biennium ended June 30, 1934 (E. S. R., 68, p. 243) includes studies of dairy cattle affected with Bang's disease, transmissibility of Bang's disease among dairy cattle in a Utah dairy village, studies of fowl pox, the susceptibility of cattle to inoculations with acidfast organisms isolated from so-called tubercular skin lesions, and Utah insects as vectors of the virus of equine encephalomyelitis, all by D. E. Madsen, and the negative effect of iritis of breeding hens on their progeny, by Madsen and B. Alder.

Annual report of the veterinary department for the year ended 31st December 1933, W. F. POULTON ET AL. (*Uganda Vet. Dept. Ann. Rpt.*, 1933, pp. 55, pls. 3).—The section of this report (E. S. R., 70, p. 676) relating to disease control (pp. 3-14) deals particularly with the work with rinderpest.

Report of the veterinary division, 1933, H. V. M. METIVIER (*Trinidad and Tobago Dept. Agr. Rpt.*, 1933, pp. 29-31).—A brief report of the occurrence of and control work with infectious diseases of livestock.

The incidence in Great Britain of *Br. abortus* infection in various domestic animals as indicated by the agglutination test, F. W. PRIESTLEY (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 181-189).—The results obtained in the application of the agglutination test for *Brucella abortus* to 1,210 cattle, 569 horses, 517 pigs, and 348 sheep are recorded. It is estimated that in Great Britain "not less than 20 percent of the cows have antibodies specific to *B. abortus* in their blood. The incidence is considerably higher in cows than in heifers or steers, as might be expected. It is also estimated that in this country 5 to 15 percent of the horses have specific antibodies in their blood. A statistical examination of the results obtained with one series of horse sera suggests that the incidence in males and females is similar, and that the amount of antibody present in the blood increases with age. There is no evidence that in this country swine or sheep suffer from *B. abortus* infection."

Investigations of Aujeszky's disease [trans. title], D. JONNESCO (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 26, pp. 1184-1186).—This disease, rarely met with in Rumania, was first observed in that country in 1914 in two bovines and later in two dogs and a hog. In the present contribution the author reports upon studies of the disease as observed in the dog and small laboratory animals.

Brucella infections in animals and man: Methods of laboratory diagnosis, I. F. HUDDLESON (*New York: Commonwealth Fund; London: Oxford Univ. Press*, 1934, pp. XIV+108, [pls. 18], figs. [2]).—Following a brief introduction by W. Giltner (pp. VII-IX), the subject is taken up under the headings

of the genus *Brucella*, methods of isolating *Brucella*, the pathology of *Brucella* infections, serological methods of determining *Brucella* infections, allergic methods of determining *Brucella* infections, method of determining *Brucella* infections by measuring the opsonocytaphagic power of the blood, and methods of differentiating the species of the genus *Brucella*. A bibliography of 189 titles and a subject index are included.

A new treatment of traumatic dermal myiasis, M. A. STEWART and A. N. BOYD (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 6, p. 402).—The authors report upon the use of a new douche, composed of 15 percent chloroform in light vegetable oil, employed in the treatment of 17 cases of traumatic dermal myiasis due to the screwworm. In every case all the maggots were removed with a single treatment extending over a period of 30 min.

Developments in the treatment of animal and human trypanosomiasis and in tsetse fly control in the period 1925–31 ([*Gt. Brit.*] *Econ. Advisory Council, Tsetse Fly Com. Rpt.*, 1933, pp. 27).—This is a report of a subcommittee of the Committee of Civil Research known as the Tsetse Fly Committee, appointed by the Prime Minister in 1925 to prepare a practical scheme of British inquiry and British action aimed at controlling the tsetse fly as a carrier of human and animal trypanosomiasis and at devising a preventive and curative treatment of the human and animal disease.

Studies in the variability of tubercle bacilli.—VIII, B. C. G., G. B. REED, J. H. ORR, and C. E. RICE (*Canad. Jour. Res.*, 11 (1934), No. 3, pp. 362–377, pls. 2).—In the studies conducted, five cultures of B. C. G. were shown to consist primarily or entirely of R type tubercle bacilli and to resemble R types from other sources. “When received one culture contained a few S types which were isolated. The other four cultures appeared to consist entirely of R types. After a long series of cultures, particularly in slightly alkaline Proskauer and Beck’s fluid, dissociation occurred and S types were isolated from two strains; no stable S types could be recovered from two additional strains.

“The R, or ordinary B. C. G., produced only localized infections; the S forms produced fatal progressive tuberculosis in guinea pigs. The degree of tissue involvement in fatal cases was generally less than with typical virulent tubercle bacilli.

“By means of complement fixation reactions it was shown that the S form recovered from B. C. G. cultures, like typical S virulent mammalian tubercle bacilli, contains a specific antigenic substance which is lacking in the ordinary B. C. G. and other R forms of the species. Animals immunized with S organisms are shown to develop a specific S antibody which is not present in the serum of animals treated with R organisms or the ordinary form of B. C. G. It is suggested that this lack of antigenic substance in the B. C. G. militates against its effectiveness as an immunizing agent.”

A report on tuberculosis in wild deer (*Odocoileus virginianus*), P. P. LEVINE (*Cornell Vet.*, 24 (1934), No. 3, pp. 264–266).—The author reports upon two cases of tuberculosis in wild deer, both of which occurred within 50 miles of each other in the south central portion of New York State. This is considered to be the first record of the detection of the disease in wild deer in the Western Hemisphere.

Infectious abortion, A. M. LEE and L. H. SCRIVNER (*Wyoming Sta. Bul.* 201 (1934), pp. 20, figs. 2).—A practical summary of information on Bang’s disease which includes a discussion of its prevalence and control measures applicable in Wyoming.

Rapid agglutination test for infectious abortion in cattle, C. R. DONHAM and C. P. FITCH (*Jour. Infect. Diseases*, 55 (1934), No. 1, pp. 60-71).—Contributing from the Minnesota Experiment Station, the authors report upon the effect of washing bacteria on the sensitivity of antigen preparations for the rapid test for infectious abortion, "proagglutinoid zones" in the rapid method of agglutination, the monovalent as compared with the polyvalent rapid test for *Brucella abortus* antigens, and further observations pertaining to slow agglutination of rapid test antigens.

It was found that "washing *B. abortus* organisms for use in rapid test preparations of antigen with phenolized saline solution resulted in slightly more sensitive antigens than were obtained when unwashed bacteria were used. Serums which exhibit proagglutinoid zones by the test tube method usually do not show such reactions when tested by the rapid method. This is further evidence that the two methods of testing (rapid and test tube) are dependent on some different elements of activity. Significant variations in the sensitivity of rapid test antigens made from different strains of the organisms were encountered. The sensitivity of successive preparations of the antigen made from a single strain of the organism may vary. Polyvalent preparations of rapid test antigen seem preferable.

"The problem of 'slow agglutination' of rapid test antigen has not been solved by the method of preparing such antigen as has been described in the literature. Two to 3 min. is too short a time to make the final observations of the results of rapid agglutination tests with antigen preparations now available."

Studies on a herd infected with *Brucella abortus*.—II, Incidence of milk contamination in a vaccinated herd, D. W. CALDWELL, N. J. PARKER, and E. M. MEDLAR (*Jour. Infect. Diseases*, 55 (1934), No. 2, pp. 235-242).—In this second contribution (E. S. R., 70, p. 679), the authors report that 23.6 percent of the cows that showed agglutinins for *B. abortus* in their blood serum were found to be discharging the organisms in their milk. Of these cows 72 percent were vaccinated and the remaining 28 percent unvaccinated. "Many of these cows were discharging the organisms so regularly and in such numbers that infection of the udder was detected with ease. A few were discharging the organisms so irregularly or in such small numbers that numerous examinations were necessary to detect infection of the udder. A decrease in the blood serum agglutination titer was seldom associated with disappearance of organisms from the milk of the vaccinated cows. In the case of 1 cow, contamination of the milk was detected before agglutinins were found in the blood serum.

"During a period of 3 weeks or more, daily examination of the milk from 13 cows with histories of positive blood serum agglutination failed to disclose *B. abortus*. In one instance a positive milk serum agglutination test led us to the finding of *B. abortus* in the milk of a vaccinated reactor. We had been unable to isolate *B. abortus* from the milk of this cow during 4 yr. of routine examinations."

The elimination of *Brucella abortus* from the feces of calves taking infected milk, A. F. RANNEY (*Cornell Vet.*, 24 (1934), No. 3, pp. 244-253).—In investigations conducted at the New York State Veterinary College, "*B. abortus* organisms fed to 10 calves in milk passed through the alimentary tract of all and retained their virulence for guinea pigs. From 100 samples of feces obtained while the calves were taking artificially infected milk, 40 were positive, 46 negative, and 14 undetermined. *B. abortus* was not found in the feces of any calf 7 days after the last feeding of artificially infected milk nor in

subsequent samples of feces covering a 6-week period. The agglutination test is not an accurate criterion by which to judge the length of time that a calf taking *Brucella*-infected milk may continue to eliminate the organism after the feeding is discontinued. Judging from these experiments, it seems probable that the establishment of an arbitrary 30-day period between the time when a calf receives its last infected milk and the time when it is placed with clean cattle would provide a margin of safety sufficient to protect the latter from infection carried by the feces of the calves."

Elimination of *Brucella abortus* with the milk of "carrier" cows, R. THOMPSON (*Jour. Infect. Diseases*, 55 (1934), No. 1, pp. 7-11).—In work conducted at Montreal, "the milk of 10 high-producing cows which never manifested clinical symptoms of infectious abortion but whose blood serum showed agglutinins for *B. abortus* in dilutions of from 1:50 to 1:500 was examined for the presence of *B. abortus* at intervals of 30 days over an entire lactation period by both the direct Petri plate method and inoculation of guinea pigs.

"The results indicate that inoculation of guinea pigs is slightly more efficient than the direct Petri plate method of examining milk for the detection of *B. abortus*. The results further demonstrate that *B. abortus* may be constantly eliminated with the milk of cows classified as 'healthy carriers.'"

The relation of abortion or Bang's disease to mastitis, C. ELDER (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 638-644).—It is concluded from the studies conducted at the Missouri Experiment Station that, on the basis of reports in the literature and observations made in the author's work with Bang's disease, *Brucella abortus* is not an important factor in the production of any gross lesions in the udder. It is thought that *B. abortus* infection may act as a predisposing cause and pave the way to the entrance of streptococci and other organisms that seem to be the most important in the causation of bovine mastitis.

Anaplasmosis in cattle, D. A. SANDERS (*Florida Sta. Rpt.* 1933, p. 62).—The transmission of *Anaplasma marginale* by *Tabanus fumipennis* Wied. and the stable fly and by the American dog tick is briefly referred to (E. S. R., 69, p. 265).

Preliminary studies on the complement-fixation test for the diagnosis of bovine anaplasmosis, C. W. REES and W. M. MOHLER (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 669-674).—Experimental data here presented, the details of which are given in tabular form, are considered to support the following conclusions: "Antigen prepared from nymphs and adults of *Rhipicephalus sanguineus* [the brown dog tick] known to harbor the etiological agent gave positive complement fixation against a serum from an active case of anaplasmosis. The antigen was demonstrable in nymphs that engorged on a clinical case, and the antigenic properties appeared to increase during the engorgement either on susceptible bovines or on rabbits of adults that molted from these nymphs. The antigen did not appear to be present in adults that engorged as larvae, nymphs, and adults on rabbits.

"Antigenic value was demonstrable by complement fixation with engorged females of *Boophilus annulatus* [the cattle tick] obtained from tick fever-affected cattle against both pure anaplasmosis serum and against serum of an animal known to be affected with piroplasmosis but from which anaplasmosis could not be excluded absolutely. Infected larvae of this species showed similar antigenic value.

"These studies indicate the possibility of developing a serological diagnostic method for detecting carriers of the disease."

Preliminary note on the transmission of bovine haemorrhagic septicaemia by the flea *Ctenocephalus felis* Bouche, R. DAUBNEY, J. R. HUDSON, and J. I. ROBERTS (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 211-213).—The authors report upon transmission experiments with hemorrhagic septicaemia in which in two instances successful transmission to mice was obtained with the cat flea.

Develop new method to detect mastitis: Brom thymol color test long used in laboratory now available for use in dairy barn—believed more accurate than strip cup, G. J. HUCKER (*Farm Res. [New York State Sta.]*, 1 (1934), No. 1, pp. 1, 3, 6, fig. 1).—A practical discussion of the diagnosis of mastitis, earlier reports of work with which have been noted (E. S. R., 71, p. 696; 72, p. 106).

Studies on the transmission of bovine mastitis, W. T. MILLER (*Cornell Vet.*, 24 (1934), No. 3, pp. 230-244).—Following a review of the literature presented in connection with a list of 41 references, the author reports upon experimental work, the details being given in tabular form.

"Mastitis was produced in one or more quarters of each of three cows by injection of a suspension of *S[treptococcus] agalactiae* in sterile lactose-saline solution into the teat canal with a blunt, small gage needle. Quantities of this culture of from 0.1 to 10 cc were used. In the animal which received the larger quantities of suspension, a prompt systemic reaction occurred which was followed by disappearance of the streptococci in a few days from each quarter. Ten days later, apparently permanent infection of the quarter was produced by the use of smaller quantities of a suspension of the same culture. An acute attack of the disease, which presently became chronic, occurred in each quarter infected in this manner. It was not possible to transmit mastitis by means of a milking machine from two of these infected animals to two healthy ones during an exposure period of several weeks."

Natural and experimentally produced gangrenous mastitis in cows, C. J. PARSHALL (*Cornell Vet.*, 24 (1934), No. 2, pp. 146-155, figs. 3).—"Bacteriological examinations of 12 gangrenous mastitis cases which were accompanied by marked edema indicated a mixed infection of *Staphylococcus aureus* and some anaerobes, of which *Clostridium welchii* was the most important. Typical cases resulted from inoculation with these organisms in pure culture. Cultures of *C. welchii* and *S. aureus* when injected alone produced mild cases of mastitis; when the two were mixed, however, a typical gangrenous mastitis followed in 3 out of 6 cows inoculated."

Although due to the rapid course it would seem impossible to do anything to save the udder, it is thought that an immune serum given early would greatly increase the chances for a more rapid recovery of the cow and the possibility of its slaughter for beef after the wound has healed. Treatment with an immune serum is considered to have been promising enough to deserve further trial.

"Immune" and "hyperimmune" cattle plague antiserum, S. C. J. BENNETT (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 163-180).—In this contribution (E. S. R., 71, p. 845), the merits of immune and hyperimmune rinderpest antiserum are discussed in the light of both theoretical considerations and experimental evidence.

"Examination of the experimental evidence, both that provided in the present paper and earlier work, leads to the following conclusions: Immune serum recovered from cattle which have undergone an uncontrolled attack of cattle plague appears constantly to be of the highest potency. Immune serum from cattle which have undergone a partially controlled attack of the disease is of

extremely variable potency; the potency, moreover, appears not to bear a constant relation either to the severity of the symptoms or to the intensity of any particular symptom in the destined serum producer during the process of preliminary immunization. Good sera have even been recovered from apparent nonreactors, and useless sera from apparently severe reactors.

"Hyperimmune serum is constantly of adequate potency. The potency of hyperimmune serum is neither referable to persistence of residual antibodies formed during the process of preliminary immunization nor to a mere maintenance of their titer by subsequent injections of virus; it is directly referable to the actual hyperimmunizing injection, as shown by the fact that beasts providing immune serum of low value will provide hyperimmune serum of high value after even a single hyperimmunizing injection."

A note on two new blood parasites of cattle, Eperythrozoon and Bartonella, S. ADLER and V. ELLENBOGEN (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 219-221, figs. 2).—The name *E. wenyonii* is given to a parasite found in the erythrocytes of a splenectomized calf and *B. sergenti* to the new form found in the red cells of a calf, both inoculated with *Theileria annulata* in the course of studies at the Hebrew University, Jerusalem.

Some physiologic and pathologic aspects of sterility in cattle, W. L. BOYD (*Cornell Vet.*, 24 (1934), No. 2, pp. 138-145).—Contributing from the Minnesota Experiment Station, it is pointed out that recent advances in the field of reproductive endocrinology have given new impetus to the investigation of sterility. "Continued studies of the persistent corpus luteum indicate that reduced fertility because of delayed regression of the gland is the result of a dysfunction of the sex endocrine glands. Endocrine therapeutic agents in the treatment of sterility are of questionable value at present. Of the mineral deficiencies that may interfere with reproduction, a lack of phosphorus is thought to be the most important. Experiments conducted at this station showed that cattle fed on a diet low in calcium did not develop infertility."

Calf losses due to iodine deficiency, R. H. MILLS (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 645-652, figs. 3).—Losses of calves, due to iodine deficiency in eastern Shasta County, in the northern part of California, are reported, the details being given in tables. The findings are considered to emphasize the necessity for having an agglutination test for Bang's disease applied before proceeding with control measures relating to handling calving troubles.

Vibrionic abortion of sheep, H. GILMAN (*Cornell Vet.*, 24 (1934), No. 2, pp. 207-209).—The author records the occurrence of cases of vibrionic abortion in a flock of about 50 Southdown ewes that were kept under ideal conditions. This is thought to be the fourth time the disease has been recognized in the United States and the second time in New York State (*E. S. R.*, 42, p. 570). The disease appears to have been introduced with ewes purchased in Canada.

Parasitic gastro-enteritis in sheep, W. L. STEWART and S. E. PIERCY (*Vet. Rec.*, 14 (1934), No. 39, pp. 1165-1169).—In the work reported 100 yearling sheep suffering from parasitic gastroenteritis were divided into four groups of 25, three being dosed, respectively, with a 1 percent solution of copper sulfate, 16 grains of anhydrous copper sulfate, and 2 cc of tetrachlorethylene. The treatment was repeated at weekly intervals for 6 weeks and then fortnightly for 4 weeks.

The sheep suffering from a well-marked infestation of gastroenteritis showed an increase in the numbers and proportion of lymphocytes and a decrease in the numbers and proportion of neutrophile leucocytes. "Six weeks after the com-

mencement of treatment the blood picture had returned to normal, whereas that of the untreated sheep was still typical of parasitic gastroenteritis. Differential leucocytic counts provided the first indication of resolution on the part of the affected sheep. From the data obtained it cannot be said that copper sulfate exerts a marked specific lethal action on the common gastrointestinal parasites of sheep. That it does favorably influence recovery from the disease is undoubted. The liquid and powder forms would seem to be about equal in efficacy, and this drug appears to be more effective than tetrachlorethylene."

Observations on the sheep tapeworm, *Moniezia expansa*, in California, S. B. FREEBORN and L. J. BERRY (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 611-616, fig. 1).—Attempts to produce infestation of lambs with the common sheep tapeworm (*M. expansa*), immunity to reinfection, and treatment of infested animals are briefly considered.

Avian tuberculosis of sheep, G. S. HARSHFIELD and L. M. RODERICK (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 597-610, figs. 3).—Contributing from the North Dakota Experiment Station, the authors report upon four cases of avian tuberculosis in sheep which developed under field conditions. All were generalized cases with extensive dissemination of the disease and marked calcification of the lesions. "Three test sheep, injected intravenously with one of the strains, resulted in two positive cases, one of which was generalized. Two positive cases were produced by the feeding of tuberculous chicken livers. The disease was localized in the mesenteric glands in both. Fifteen sheep were exposed to a tuberculous chicken flock for approximately 1 yr., and this exposure resulted in infecting two of that number. Sensitization to avian tuberculin was produced in 20 of the 21 experiment sheep, although the period of sensitization was short. No reactions were obtained to mammalian tuberculin. Those transitory infections were, therefore, no doubt regressive in most cases."

A report of two additional cases of suspected tuberculosis in sheep typed and found due to the avian type is appended.

A case of spontaneous tuberculosis in a goat, H. SCHWABACHER (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 214-218).—A review is given of the literature relating to cases of spontaneous tuberculosis in goats, and the details are recorded of a new case in which pathological and bacteriological examinations were made. The bovine type of organism was isolated.

Comparative values of hemoglobin determinations on porcine blood by the Tallquist, Dare, and Newcomer methods (with graphs for conversion), H. C. H. KERNKAMP and C. R. DONHAM (*Cornell Vet.*, 24 (1934), No. 3, pp. 254-259, figs. 2).—The authors consider the art of hemoglobinometry as it pertains to the hemoglobin determination of porcine blood in particular. They have found in investigations at the Minnesota Experiment Station, using the Tallquist, Dare, and Newcomer methods, that the conversion of hemoglobin determinations from one scale to another is justifiable, and that prediction values can be applied to individual cases because the errors of such values will not be significant from the clinical point of view.

Attempts to infect swine with *Salmonella pullorum* [trans. title], K. WAGENER (*Deut. Tierärztl. Wchnschr.*, 42 (1934), No. 12, pp. 180, 181).—Two pigs some 8 to 10 weeks of age and weighing about 40 lb. were kept under observation for 7 mo. During this time they were repeatedly fed upon *S. pullorum* infected chicks and also on pure bouillon cultures of the organism without becoming infected, as was determined at post-mortem examination. Neither did infection result from the repeated subcutaneous injection of cultures of this organism. The results indicate that swine possess a high natural resistance to it.

The role of *Salmonella suipestifer* in the production of an enteric disease independent of hog cholera virus, H. E. BIESTER (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 190-196).—In this contribution, based upon work in Iowa, the author reports finding that "*S. suipestifer* is capable of producing a pathologic enteric condition under poor sanitary conditions in the field in both hog cholera immune and susceptible swine and that it can be produced experimentally. With the lapse of time, in the presence of destroyed intestinal tissue the *Actinomyces necrophorus* assumes an important role, being the chief cause of the marked thickening of the wall by its progressive invasion of the deeper structures of the intestine."

Effect of low temperature freezing on the encysted larvae of *Trichinella spiralis*: Studies on muscle of rats, guinea-pigs, and hogs, J. B. BLAIR and O. W. LANG (*Jour. Infect. Diseases*, 55 (1934), No. 1, pp. 95-104).—The experimental work here reported is considered to have shown that "encysted trichinal larvae are killed in a few minutes when the ground meat is frozen very rapidly at or below -17.8° C. (0° F.). Trichinal larvae, encysted in the leg muscles of rats frozen in from 20 to 40 min. at -17.8 or -21.2° and stored at those temperatures are not killed until stored for 72 hr. at -17.8 or for 56 hr. at -21.2° . Numerous trichinae in similar samples are shown to be alive after exposure for 3, 5, and 2 hr. to temperatures of -23.9 , -29.4 , and -32.2° , respectively. All trichinae in similar samples are killed after exposure for 2 hr. to a temperature of -35° . Data are presented which indicate that an increase in the age of the larvae increases their resistance to freezing. A comparison of our results with those of previous investigators indicates that larvae developed in the muscle tissues of rats are far more resistant to the effects of freezing than those developed in the muscle tissues of guinea pigs.

"Infected pork in commercial quantities was rapidly frozen to a temperature of -17.8° and stored at that temperature; samples were examined at frequent intervals. Active trichinae were demonstrated in all the samples up to 48 hr. of storage. The number of larvae found was too small to permit an accurate determination of the time required for sterilization.

"Based on the results obtained so far, it appears that it may be possible to kill trichinal larvae in pork by rapidly lowering the temperature of the meat to -35° or below and holding it at that temperature for 2 hr. This has not been experimentally determined with pork, and in view of the slow rate of change in temperature of commercial quantities of meat it appears commercially impracticable. Commercial quantities of pork rapidly frozen to -17.8° and stored at that temperature must be stored for a period longer than 48 hr."

The protective action of copper against *Trypanosoma equiperdum* infection in albino rats, D. PERLA (*Jour. Expt. Med.*, 60 (1934), No. 5, pp. 541-546).—The studies here reported have led to the conclusion that the natural resistance of the rat to infection with *T. equiperdum* can be markedly raised by supplements of copper to the diet prior to infection.

Certain properties of the virus of equine encephalomyelitis, B. F. HOWITT (*Jour. Infect. Diseases*, 55 (1934), No. 2, pp. 138-149).—In continuation of studies of the properties of the California virus of equine encephalomyelitis (E. S. R., 69, p. 592), its filtrability and preservation, and the testing for it in certain body tissues, effect of heat, degree of H-ion concentration, certain chemicals, testicular extract, and neutralizing antibodies on contact with blood clot, complement, or red blood cells are considered.

Attempts to transmit equine encephalomyelitis by means of blood sucking insects, especially mosquitoes, W. B. HERMS, C. M. WHEELER, and

H. P. HERMS (*Jour. Econ. Ent.*, 27 (1934), No. 5, pp. 987-998, figs. 3).—In transmission experiments with four blood-sucking dipterans, namely, the horn fly, a horsefly (*Tabanus punctifer*), and the mosquitoes *Aedes dorsalis* and *Anopheles maculipennis*, all failed to convey the virus of equine encephalomyelitis under the conditions furnished.

The possible effect of irradiation on equine encephalomyelitis and on canine distemper, S. A. GOLDBERG (*Cornell Vet.*, 24 (1934), No. 3, pp. 267-269).—A description is given of a method of treatment of cases of encephalitis lethargica by irradiation. Since the lesions in equine encephalomyelitis and in the nervous form of canine distemper are similar to those of encephalitis lethargica in man, it is thought that they should likewise respond to this method of treatment.

[Contributions on canine distemper] (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 576-596).—These contributions include Serum Concentrate-Living Virus Immunity against Canine Distemper—Second Report, by G. W. Little (pp. 576-590); Further Observations on the Use of Serum Concentrate (Little) to Control Canine Distemper, by W. J. Lentz (pp. 590-592); Experiments to Produce Immunity to Canine Distemper in Ferrets, by V. Ross (pp. 592-595); and Report on Serum Concentrate (Little), by M. L. Morris (pp. 595, 596).

Spontaneous tuberculous infections in dogs, W. H. FELDMAN (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 653-663, figs. 3).—This contribution, presented in connection with a list of 22 references to the literature, reports upon a case of spontaneous tuberculosis in a dog kept under laboratory conditions. The infection was found to be due to the bovine type of the organism, the primary lesion having been in the lung with secondary involvement of the liver.

The mortality problem, I-III, M. A. JULL (*U. S. Egg and Poultry Mag.*, 40 (1934), Nos. 7, pp. 28-31, 60-63, figs. 4; [8], pp. 44-47, 61-63, figs. 6).—The several parts of the contribution deal with embryo mortality, chick mortality, and laying hen mortality, respectively. The contribution is presented with a list of 36 references to the literature.

The nature of cannibalism occurring among adult domestic fowls, C. H. WEAVER and S. BIRD (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 623-637).—Studies conducted by the Canadian Department of Agriculture are here presented, the results of observations being given in tabular form. The data are said to have been collected from a single poultry plant and are not necessarily representative of flocks in general. The evidence is considered to leave little doubt of the cannibalism having been in the nature of a complex as to cause. A large part of it undoubtedly was induced by the subnormal physical condition of the killed subjects. In such a case this natural culling should tend to an improvement of the health status of the flock in subsequent generations. The most likely explanation of the ascending mortality recorded is that certain factors, environmental or otherwise, resulting in the undermining of the health of the fowls leading to their killing, were so overwhelmingly greater influences than the beneficial results made possible by the culling as to render them quite negligible.

Keeping qualities of incubator dried laryngotracheitis virus as determined by cloacal inoculation, F. R. BEAUDETTE and C. B. HUDSON (*Cornell Vet.*, 24 (1934), No. 2, pp. 163-171).—Contributing from the New Jersey Experiment Stations, a report is made of observations of the tenacity of the laryngotracheitis virus in two lots of exudate as related to its potency in cloacal vaccination, the details being presented in tabular form. The potency

of the two lots was about equal after holding 3 mo., but there was a marked decrease in that of one after about 6 mo. Of the two methods of application and irrespective of virus or dose the swab appeared to have a slight advantage.

Examination of the brachial plexus of normal fowls for lymphoid infiltrations, V. E. PALMER and J. BIELY (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 205-210).—The authors report upon a microscopic examination for the presence of lymphoid cells in the spinal cord and nerve roots in the brachial region of apparently normal birds. They have found that, in dealing with apparently normal birds or with birds affected with lymphomatosis, if the observations have been confined to the brain or sciatic nerves alone it is not justifiable to draw conclusions concerning the presence or absence of lymphoid infiltrations.

Further observations on cell inclusion disease of fowls and differential diagnosis from fowl plague, S. J. GILBERT and G. B. SIMMINS (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 3, pp. 201-204).—Summarizing observations made at the Veterinary Laboratory, Jaffa, Palestine (E. S. R., 66, p. 577), it is pointed out that "the similarity of exceptional cases of cell inclusion disease to fowl plague raises the question of identity and differential diagnosis. There are, however, great differences between them, and these differences would appear to separate them clearly. They may be summarized as follows: (1) Cell inclusion disease is well known to exist in a chronic form, and is sometimes so slight that, clinically, it would pass unnoticed. (2) The variable mortality even in acute outbreaks. (3) The usual instability of the virus when preserved in glycerin saline. (4) The association of the disease with distinct inclusions in the leucocytes. (5) The frequent occurrence of visible alteration in the liver, and the absence in the majority of cases of marked bowel changes. (6) The variation in virulence according to the severity of the attack."

Partial or doubtful reactors to the whole blood stained antigen test for pullorum disease, J. P. TORREY and R. GRAHAM (*Cornell Vet.*, 24 (1934), No. 2, pp. 156-162).—A report is made of work with a group of 25 partial or doubtful reactors to the whole blood stained antigen test in the field which was repeatedly tested by the whole blood stained antigen, rapid plate, and tube agglutination tests.

"A total of 12 of the 25 became consistent reactors to 1 of the 3 tests: 4 to the whole blood stained antigen, 3 to the plate, and 4 to the tube test. The tube and whole blood stained antigen gave repeated similar results in only 1 fowl. Twenty-one fowls gave inconsistent agglutination reactions to the whole blood stained antigen, 22 to the rapid plate, and 19 to the tube. None of the 25 showed gross ovarian lesions of pullorum disease, while 1 yielded positive *S[almonella] pullorum* in direct cultures of ovarian and liver tissues."

Fowl-pox control in baby chicks (*Hawaii Sta. Rpt.* 1933, p. 21).—Brief reference is made to the value of vaccine in developing immunity against the disease in chicks.

The toxicity of certain species of *Crotalaria* seed for the chicken, quail, turkey, and dove, E. F. THOMAS (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 5, pp. 617-623, fig. 1).—In work at the Florida Experiment Station the seed of *C. spectabilis* was found to be toxic to chickens, quail, and doves when fed or eaten in considerable numbers. Under natural conditions the seed will be eaten by chickens, and sickness and death may be produced. Quail, however, did not eat the seed when placed before them or in the field. Turkeys were not poisoned by as many as a thousand seed. This plant is said to have been introduced into the State by seed received at the station in March 1921, since which time it has been grown in most parts of the State

and many of the other Southern States for use as a soil-building legume. Seeds of other species of the genus, including *C. striata*, *C. grantiana*, *C. incana*, and *C. intermedia*, were not toxic when force-fed in 5- and 10-g doses to chickens and quail.

Prosthogonimus macrorchis n. sp., the common oviduct fluke of domestic fowls in the northern United States, R. W. MACY (*Amer. Micros. Soc. Trans.*, 53 (1934), No. 1, pp. 30-34, figs. 3).—The fluke found in the oviduct of the domestic fowl in northern United States, which is identical with the form studied by Kotlan and Chandler (*E. S. R.*, 55, p. 778), is described as new under the name *P. macrorchis*. Minneapolis, Minn., is given as the type locality and the domestic hen as the type host.

Studies on the taxonomy, morphology, and biology of Prosthogonimus macrorchis Macy, a common oviduct fluke of domestic fowls in North America, R. W. MACY (*Minnesota Sta. Tech. Bul.* 98 (1934), pp. 60, pls. 11, figs. 3).—The results of investigations of the taxonomy, geographical distribution, morphology, biology, economic importance, diagnosis, and prevention of and treatment for *P. macrorchis* (above described) are reported. A historical résumé of information on the genus *Prosthogonimus*, particularly from the biological and economic standpoints, is presented, together with methods of general survey work, care of experimental animals, and technic of the preparation of permanent mounts of material. A diagnostic summary of the description of *P. macrorchis* is given, together with its differentiation from the other members of the genus, a key for the separation of the species, taxonomic position, and a brief description of each species of the genus. There is presented a detailed account of the gross and histological morphology of the adult, sporocyst, cercaria, and metacercaria of *P. macrorchis*. It was found that no redia form was present in the life cycle of this species.

In the experiments conducted, "a mallard duck, with atrophied bursa Fabricii, could not be infested with *P. macrorchis*. Examples of *P. macrorchis* in an experimentally infested crow (*Corvus brachyrhynchos*) matured in 17 days. Eight out of 10 cysts of *P. macrorchis*, fed to an English sparrow (*Passer domesticus*), produced mature flukes in 14 days. Two specimens of *P. macrorchis* were taken from a domestic duck 18 weeks after infestation. Ducks are believed to be the normal hosts for *P. macrorchis*, and the domestic hen is thought to be an abnormal host for it. Hens lose their infestation of *P. macrorchis* in from 3 to 5 weeks. *P. macrorchis* shows a tendency to considerable variation. In general, the specific characters of *P. macrorchis* hold for specimens reared in the ducks, crows, chicks, and English sparrow, although host modification was evidenced in each case. . .

"*Amnicola limosa porata* was found to be the first intermediate host of a species of *Prosthogonimus*, presumably *P. macrorchis*. Dragonflies of the genera *Leucorhinia*, *Tetragoneuria*, and *Epicordulia* were found to be important hosts of *P. macrorchis*. Dragonflies of the genus *Mesothemis* carry *Prosthogonimus*, but only to a limited extent. Individuals of *Leucorhinia* carry the largest numbers of *Prosthogonimus* cysts. One naturally infested naiad of this group was found to contain 90 mature cysts of this fluke. Dragonflies of the genera *Anax*, *Pachydiplax*, *Sympetrum*, and *Gomphus* were found to be free from *Prosthogonimus* cysts. . .

"Positive diagnosis of prosthogonimiasis may be made through the finding of the eggs of *Prosthogonimus* by fecal examination, but negative results of such examination, even when concentration methods were used, were found to be unreliable. To prevent their infestation with *Prosthogonimus*, it is

necessary to keep hens fenced away from the shores of lakes containing the dragonfly intermediate hosts of the fluke."

A 5-page list is given of the references to the literature cited.

An outbreak of leptospiral jaundice in silver-fox cubs: Some post-mortem observations, D. R. MACRAE (*Vet. Rec.*, 14 (1934), No. 39, pp. 1170, 1171, fig. 1).—This is a report of an outbreak in silver fox cubs in which the presence of *Leptospiras* morphologically resembling *Leptospira icterohaemorrhagiae* were demonstrated.

A study of some parasites of rabbits of central Oklahoma, J. W. WARD (*Okla. Acad. Sci. Proc. [Okla. Univ.]*, 14 (1934), pp. 31, 32).—Twelve species of Arthropoda, 4 of Cestoda, 7 of Nematoda, and 5 of Protozoa are listed as having been found to parasitize rabbits in central Oklahoma.

AGRICULTURAL ENGINEERING

Water control investigations upon the flatlands of the Florida Everglades, R. V. ALLISON and B. S. CLAYTON (*Florida Sta. Rpt.* 1933, pp. 172, 173).—The progress results are briefly reported of studies of water level in observation wells and on the installation of a detailed set-up for water table studies. This work is being conducted in cooperation with the U. S. D. A. Bureau of Agricultural Engineering.

Relationship of stream discharge to precipitation, with special reference to forecasting the supply of water for irrigation from seasonal surveys of snow cover on mountain watersheds, G. D. CLYDE (*Utah Sta. Bul.* 250 (1934), pp. 58, 59).—Progress results are briefly presented.

The silt problem, J. C. STEVENS (*Amer. Soc. Civ. Engin. Proc.*, 60 (1934), No. 8, pt. 1, pp. 1179–1222, figs. 9).—This paper presents data on the silting of reservoirs obtained from actual capacity surveys, and discusses remedial measures for silt elimination. A table contains a brief of all data on the silt transported by the streams of the world. The physical laws of silt transportation are outlined, with pertinent discussion. The control of silt in canals, reservoirs, and on watersheds is then considered. The paper closes with data and discussion on the origin of silt.

Proper spacing and depth of tile drains determined by the physical properties of the soil, J. H. NEAL (*Minnesota Sta. Tech. Bul.* 101 (1934), pp. 62, figs. 30).—A study is reported of four tile drainage systems, located at Meadowlands, Aitkin, Paynesville, and Waseca with a wide variation in soil type, spacing, and depth. Studies were made of the fluctuations of the ground water caused by precipitation at each of these stations over a period of 4 yr. and the results correlated with the physical properties of the soils.

The soils included shallow, well decomposed woody peat overlying a yellowish gray to gray sand or very sandy loam, a light brown silty clay loam overlying 30 in. of gray silty loam containing less organic matter, a soil varying from a muck 6 in. in depth to a well decomposed peat 2 ft. in depth overlying a stratum of mucky clay from 6 to 12 in. in depth, and a light brown, heavy silt loam overlying gray boulder clay.

The results show that in northern latitudes where the ground remains frozen all winter the winter precipitation can usually be disregarded as far as the design of the tile system is concerned, because the snow melts in the spring and runs off over the surface before the ground thaws.

About one-half of the rainfall from March 1 to October 31 occurs in rains of less than 1 in., one-fourth in rains of 1 to 1.99 in., and one-fourth in rains

of 2 in. or more. In terms of the number of storms, less than 1 in. falls during 82 percent of the storms, 1 to 1.99 in. fall during 12 percent, and 2 in. or more fall during 6 percent of the storms. As there is an average of 30 storms per season (March 1 to October 31), there would be an average of less than 2 storms per year when 2 in. or more fell in 24 hr.

Little or no flow occurs through the tile drains after a rain if there has been less than 3 in. of rain in the previous month. Practically all rains of more than 1 in. when preceded by 3 in. or more in the previous month cause run-off. Rains of less than 1 in. occurring during the growing season (May 1 to August 31) are not likely to cause run-off through tile lines, unless they are preceded by 4 in. or more during the previous month. As a general rule, the percentage of run-off is less for the larger than for the smaller rains which cause run-off and is less during the growing season than for early and late rains, since the growing crops exert a noticeable influence upon the amount of run-off. The maximum run-off usually occurs during the first 6 hr. after the heavy part of the storm and may exceed a rate of 1 acre-in. per day if the system will carry it. Where there are surface inlets to the tile line the time of concentration is less than 6 hr.

Following a dry period of from 2 to 4 weeks during the growing season, it takes several inches of rain to bring the soil to its maximum capillary capacity. Until this point is reached there will be no fluctuation of the water table and consequently no action by a tile drainage system. After the capillary capacity is reached, the ground water table rises rapidly during a storm but subsides very much more slowly, the rate of drop being an exponential function of both the hydraulic slope and the tile spacing, as indicated by the following equations: $R_d = 0.165 S^{3/4}$ in which R_d is the rate of drop midway between tile lines in feet per day. S is the hydraulic slope expressed as feet of head of the ground water surface above the tile per 100 ft. distance from the tile lines. $R_d = K(T_s)^{-0.7}$. R_d is the rate of drop, K is a drainage factor depending upon the hydraulic slope and the type of soil, and T_s is the tile spacing in feet.

The rate of drop is much faster during the growing season than for early spring and late fall rains, owing to the combined action of heavy transpiration and tile drainage when it exists. The proper spacing and depth of tile lines is dependent upon three important factors, namely, (1) the type of soil, (2) the types of crops grown, and (3) the climatic conditions. The observations indicate that the crops were not seriously injured if the water table was held at least 6 in. below the surface and was lowered at the rate of 1 ft. per day through the second 6-in. depth interval and at the rate of 0.7 ft. per day through the third 6-in. depth interval.

Spacing and depth of tile lines is an exponential function of some physical property of the soil as, for example, (1) the moisture equivalent, (2) the plasticity, and (3) the percentage of clay. This functional relationship to the moisture equivalent is shown in the following equations:

$$T_s = \frac{12,000}{(M_e)^{1.6}}$$

$$T_s = \frac{10,000}{(M_e)^{1.55}}$$

$$T_d = \frac{17.5}{(M_e)^{0.5}}$$

T_s = the tile spacing in feet, T_d = tile depth in feet, and M_e = moisture equivalent.

The general conclusion is drawn that the effectiveness of a tile drainage system as a protection for, and a stimulant of, crop growth is manifestly dependent

on the rate of drop of the water table at the midpoint between the drains. This rate of drop is dependent on the texture and moisture condition of the soil when well drained and on the depth and spacing of the tile drains, and both rate of drop and depth and spacing of tile drains are definite functions of the moisture equivalent, the plasticity, or the clay content of the soil under consideration.

Before the method of tile drainage design herein presented can be considered complete, it is considered probable that these equations should be checked under a wider variety of soil and climatic conditions.

An equipment for demonstrating soil erosion and its control, F. G. MERKLE (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 7, pp. 626-628, figs. 2).—In a brief contribution from the Pennsylvania Experiment Station equipment is described consisting of a rack to hold several erosion trays at any desired slope, trays in which various soils or cover crops may be compared, and carboys to receive the turbid run-off.

The individual trays are 4 in. deep, 12 in. wide, and 32 in. long. A dam with beveled edge is placed 3 in. from the lower end, thus providing a place for the surface run-off to collect so that it may be led by means of the rubber tubing into the carboy.

A $\frac{3}{4}$ -inch galvanized pipe spans the front of the frame, being held to the uprights with straps. Along this pipe at intervals of 2 ft. are spaced Skinner greenhouse nozzles designed to give a very fine spray. Those afford a very uniform distribution of "rain" over all trays.

Public Roads, [October and November 1934] (*U. S. Dept. Agr., Public Roads*, 15 (1934), Nos. 8, pp. 185-216+[2], figs. 3; 9, pp. 217-236+[2], figs. 16).—These numbers of this periodical contain respectively the status of U. S. Public Works road construction as of September 30 and October 31, 1934. No. 8 also includes an article on The Taxation of Motor Vehicles in 1932, by G. P. St. Clair (pp. 185-214); and No. 9, Effect of Mixing Time on Quality of Concrete Produced in Large Mixers, by W. A. Blanchette (pp. 217-230), and Further Tests of Cotton Mats for Curing Concrete (pp. 231-234).

Plywood as a structural covering for frame walls and wall units, G. W. TRAYER (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab.*, 1934, pp. 18, figs. 5).—Tests are reported the purpose of which was to determine the extent to which plywood can impart strength and stiffness to a house wall, to show the relation between method of fastening the sheet to the frame and the amount of inherent stiffness and strength utilized, and to secure a measure of the performance of small units offering possibilities from the standpoint of fabrication and assembly. All test panels were 8 ft. high by 12 ft. long. They were either a single unit of those dimensions or an assembly of three separate units each 8 ft. high by 4 ft. wide. Those made as a single unit consisted of 2 by 4-in. upper and lower plates, 3-piece end posts, and 2 by 4-in. studs spaced 16 in. The end posts consisted of two 2 by 4-in. pieces spaced $\frac{3}{8}$ in. to which a third 2 by 4 was nailed with its 4-in. side perpendicular to the 4-in. sides of the other two. One of these panels was framed for a double 26 by 28-in. window, and two were framed for a double 26 by 28-in. window and a 2 ft. 8 in. by 6 ft. 8 in. door. Two 16-penny nails were driven through the upper and lower plates into the ends of the studs. The framing material was southern yellow pine, and the plywood which was attached to the frame was of Douglas fir, sanded two sides, and in sheets 4 by 8 ft.

The results showed that plywood in large sheets, $\frac{1}{4}$ in. or more in thickness, well nailed to a frame wall affords several times the rigidity and strength that is afforded by horizontal sheathing. In this respect it compares favorably with diagonal sheathing. The extent to which the inherent rigidity and

strength of large plywood sheets are utilized depends upon the security with which the plywood is attached to the frame. It is entirely possible, for example, to obtain greater rigidity with $\frac{1}{4}$ -in. plywood well nailed to the frame than with $\frac{5}{8}$ -in. plywood inadequately nailed. By gluing plywood to the frame a rigidity is obtained that is far superior to anything possible with nailing.

Wall units of convenient size for factory fabrication and facile erection can be assembled with glued splines in such a way that in rigidity and strength they are fully equal to similarly sheathed large wall panels framed in the conventional manner. A design for such units is described in the report.

A study of the properties of mortars and bricks and their relation to bond, L. A. PALMER and D. A. PARSONS ([*U. S.*] *Bur. Standards Jour. Res.*, 12 (1934), No. 5, pp. 609-644, figs. 17).—The water-retaining capacity, transverse and compressive strengths, sorption, volume changes, and moduli of elasticity of 50 mortars and the absorption rate, moisture expansion, and transverse and compressive strengths of six makes of brick were studied. Also, 15 of the 50 mortars were used with the six makes of brick in tests of brick-mortar assemblages.

It was found that the extent of bond was affected by the properties of both mortars and bricks, but chiefly by the water-retaining capacities of the mortars and the absorption rates of the bricks. With bricks of high rates of absorption set dry, the extent and in most cases the strength of bond was best with mortars of high water-retaining capacity. Although the extent of bond was good (practically complete), the strength of bond obtained with very impervious bricks having smooth, glassy, bonding surfaces was generally lower than that obtained with the other makes of bricks. Rough-surfaced bricks with low rates of absorption, and mechanically smooth and porous bricks made practically non-absorptive by soaking in water gave good extent of bond when time in brick laying was not permitted for the water in mortars of low water-retaining capacity to separate out. When such time was allowed the extent of bond was poor with the mortars of low water-retaining capacity. The maximum bond strength at 3 mo. was obtained in the case of all mortars with bricks having a rate of absorption of approximately 20 g of water per 30 sq. in. of brick surface per minute when partially immersed (flat side down) to a depth of $\frac{1}{8}$ in. in water. The bond with mortars of low sorption and high strength was most resistant to alternate freezing and thawing.

It is indicated that best results may be generally obtained by keeping the rate of absorption of bricks below the value 40 g of water, as obtained by partial immersion (flat side down) for 1 min. in water.

Mortar tests as a guide to the strength of concrete, W. H. GLANVILLE and D. A. G. REID (*Struct. Engin.*, 12 (1934), No. 5, pp. 242-263, figs. 12).—Investigations conducted by the Building Research Experiment Station of the British Department of Scientific and Industrial Research are reported in which the object was to devise a small-scale mortar test for use as an index of the strength of concrete made from the same cement.

Preliminary tests showed that standard sand mortar strengths form as good a guide to concrete strength as those with graded sand. It was found that as a general rule the strength of the wet mortar is a greater proportion of the strength of the dry mortar for slow- than for rapid-hardening cements. The value of the mortar strengths as a guide to the concrete strengths increases as the consistence of the mortar is made wetter. Neat cement and dry mortar mixes form a very poor guide to the strength of concrete, particularly when the various ages of testing are not considered separately. The best guide to the crushing strength of concrete is given by the crushing strength of mixes

of 1:3 standard sand mortar as used under the British Standard Specification for portland cement, but with a water content of 12.5 percent of water by weight. The results enable the concrete strength at the same age to be estimated in the majority of cases to within 10 percent.

The best guide to the transverse strength of concrete is given by the transverse strength of wet mixes of 1:3 standard sand mortar, although the tensile strength of these mixes is practically as good. A few tests made with high alumina cements showed that the wet mortar strength may be used as a guide to concrete crushing strength within the same degree of accuracy as may be expected with portland cements.

Tests on reinforced brick masonry columns, M. O. WITHEY (*Amer. Soc. Testing Materials, Preprint 56 (1934), pp. 17, figs. 8*).—Tests of thirty-two 12.5 by 12.5-in. brick columns 6 ft. high made with Chicago common and with Waupaca face brick are reported. The variables included three percentages of longitudinal and a like variation in lateral reinforcement, together with two high-strength portland cement lime mortars. The results indicate that the column strength varies directly with the strength of the masonry and the percentage of longitudinal steel, and is increased by the use of lateral reinforcement. Strengths of 5,000 lb. per square inch based on gross area and over 7,000 lb. per square inch on the cores after shell spalling were attained. For suitable reinforced brick masonry columns a factor of safety of from 3.5 to 4.0 is suggested.

Tests of the fire resistance and strength of walls of concrete masonry units, C. A. MENZEL ([*Chicago*]: *Portland Cement Assoc., 1934, pp. X+215, figs. 89*).—This report presents the principal results obtained in a comprehensive and systematic investigation of the fire-resistant and load-carrying properties of 215 walls of concrete masonry units when subjected to standard fire endurance and load tests. The tests covered studies of the relative influence of such factors as type and grading of aggregate, cement content, design of unit, type of mortar, workmanship, and application of plaster. Walls about 5.5 ft. wide and 6 ft. high with a total area of about 33 sq. ft. were employed instead of walls 9 ft. in height and 100 sq. ft. in area required by the specifications. To compensate for the reduction in size of the test walls as well as to improve the precision with which such tests are usually conducted, a particularly rigid test technic was adopted.

It was found that the fire endurance period of concrete masonry walls constructed of units of a given design was independent of the type of mortar, depended to some extent on the character of the mortar joints, but depended mainly on the composition of the units as influenced by the type and grading of aggregate and the cement content. With a given type of concrete the fire endurance period of walls of the single-unit type (constructed with a single unit through the wall thickness) increased as an exponential function (exponent 1.66 to 2.03) of the average air-dry weight per square foot of wall assembly. This relationship appears to be fundamental and shows that the effectiveness of a given type of concrete in walls of the single-unit type can only be improved by increasing the weight of the concrete in the unit and not by distributing the given weight in a different design. However, with walls of the duplex and triplex types (constructed with two and three units through the wall thickness and separated by an air gap) or with walls of the single-unit type having the core spaces filled with different aggregate materials, the fire endurance period was increased at a substantially higher rate with weight increases than obtained with ordinary construction.

The application of a plaster finish to either the exposed face or both faces of the walls resulted in substantially higher fire endurance periods and wall strengths (after fire exposure) than were obtained with similar unplastered walls exposed for the same or shorter periods.

The compressive strength of concrete masonry walls tested either without exposure or after exposure to fire was directly proportional to the original compressive strength of the units. These linear relationships were obtained with walls laid up with units of a wide range in composition, design, and strength. The strength of walls tested without exposure to fire and constructed of units of a given design and strength was independent of the type of aggregate, depended to some extent on the type of mortar, but depended mainly on the type of mortar joints and character of mortar bedding. After exposure to fire the wall strength was influenced to a more marked degree by the type of aggregate than by the type of mortar but to an even greater extent by the type of mortar joints and character of mortar bedding. Closely similar strengths were obtained from walls laid up with units of a given strength with portland cement-lime mortars ranging from 1-1-6 to 1-0.15-3. When the cement content of the mortar was reduced below that of a 1-1-6 mix there resulted a decrease in wall strength which was approximately proportional to the decrease in the cement content of the mortar. These statements apply to walls exposed to fire as well as to unexposed walls.

No outstanding advantage in wall strength after fire exposure was discernible for one design of unit over another for walls of the same thickness laid up with units of different design but comparable as to the proportion of net area bedded and strength (gross area).

Five appendixes are included relating, among other things, to test procedure and temperature measurements.

Wind pressures on building, A. BAILEY (*Inst. Civ. Engin. [London], Select. Engin. Papers, No. 139 (1933), pp. 29, pl. 1, figs. 27*).—Following a brief review of the work of others with small scale models, the results of comparative tests on a large shed in the natural wind and on a scale model of the shed in a wind tunnel are reported. The shed was 100 ft. long by 42 ft. wide and had a height of 33 ft. at the ridge and 23 ft. at the eaves, the angle of slope of the roof being 25.5°. It had a heavy steel and timber framework covered on the outside with corrugated iron, with a felt-covered timber roof. At each end of the shed there were large sliding double doors 12 ft. wide by 22 ft. high.

The data obtained from the actual shed showed that the wind movement produced a substantial reduction of pressure on both the windward and the leeward slope of the roof, combined with an increase of pressure on the windward wall and a reduction of pressure on the leeward wall. No substantial difference was observed due to opening the doors, but this was to be expected since there was a gap about 4 in. wide all around the edges so that the shed was never really closed. The maximum reduction of pressure was generally at the point immediately beyond the eaves on the windward slope, and the suction fell rapidly as the wind traveled up the slope. It then began to increase again when nearing the ridge and became almost constant on the leeward slope.

Three sets of tests were carried out on the model in the wind tunnel with angles of incidence of the air stream of 0°, 20°, and 40°, and with four wind speeds in each case, and an additional test was made at one speed with the air stream parallel to the ridge. The tests with an angle of incidence of 20° showed slightly greater suction at all points on the roof with the exception of the first point on the windward side, at which point the suction was very slightly reduced. At 40° these effects were increased and the pressure on the

windward wall was reduced. The test with the wind parallel to the ridge showed a moderate suction over the whole of the section examined, including both the vertical walls, which would be due to the eddy set up by impact of the wind on the end wall of the shed.

A comparison of the full-scale and model tests showed that the general form of distribution of pressure over the roof was similar, the main differences being that in the full-scale tests the pressure on the windward wall was often less and the suction on the leeward slope was nearly always greater than that which would be predicted from the model tests.

A comparison of the tests with the wind incident at an angle of 20° showed much the same relation as at 0° , but the one set of full-scale tests which were made with the wind at 40° gave a reduction of pressure on the leeward slope which was never greater than that obtained in the corresponding model tests. The tests appear to indicate that in the case of a large structure in the open air there is a factor which is not present when tests are carried out on small models with an artificial wind in a wind tunnel. Whether this factor is a scale effect or is due to wind structure is not yet clear.

The conclusion is drawn that a 50 percent increase on the result obtained on a small model in a wind tunnel would be sufficiently near for all practical purposes. Whether the figure of 50 percent would apply to any scale ratio or to any form of building still remains to be determined.

Internal combustion engines, R. L. STREETER and L. C. LICHTY (*New York and London: McGraw-Hill Book Co., 1933, 4. ed., rev., pp. XIII+539, figs. 327*).—This is a complete revision and fourth edition of this book relating to the theory, analysis, and design of internal-combustion engines. Those phases of thermodynamics which deal with the internal-combustion-engine process have been fully developed and are introduced wherever possible.

It is pointed out that the design of internal-combustion engines now includes such subjects as flame travel, flame-front areas, combustion-chamber design, synchronous vibrations, and heat flow. Design material is found throughout the book, the conventional design of the principal engine parts being presented in the latter part of the book. The section on design has been expanded in some places and rearranged in a more logical manner. This edition contains many references to recent researches and has drawn upon them for part of the presentation.

The use of creosote and other tar oils as motor fuels, L. J. ROGERS (*Jour. Council Sci. and Indus. Res. [Aust.], 6 (1933), No. 4, pp. 47-53*).—This is a brief survey of the technical aspects of the use of creosote as an internal-combustion-engine fuel and of the economic aspects of the problem as it affects Australia.

An electrical ploughing test (*Impl. and Mach. Rev., 60 (1934), No. 714, pp. 503, 504, figs. 2*).—The results of Italian tests of two electrical plowing outfits, both of the cable type, are reported briefly. Apparently the outstanding defect is the low plowing capacity so far attainable of only about $\frac{1}{20}$ acre per hour.

Electricity in the garden (*Rural Electrification and Electro-Farming, 10 (1934), No. 112, pp. 113-115, figs. 4*).—This article gives brief accounts of experimental work on the use of neon lighting and soil-heating cables.

Laboratory experiments conducted by a commercial lamp works showed that the neon light is suitable for plant treatment in greenhouses. With pure neon light an intensity of 40 foot-candles was enough for the leaf development of cucumbers and tomatoes. Cucumbers, however, grew far more rapidly under 100 than under 50 foot-candles. On the other hand the total yield of cucumbers was greatest in the case of plants with low illumination, although the

plants under higher illumination bore the first fruits. In both cases irradiation gave a considerable increase in the crop, the average being 19.6 percent. The tomato plants, especially at maximum intensity of neon light, developed very strongly.

The experimenters concluded from their work that most greenhouse plants when treated with neon light for 8 hr. per day require illumination of at least 50 foot-candles of light. Lower intensities in most cases produced very little effect, the exception being cinerarias.

Hothouse strawberries irradiated with neon light not only yielded a more abundant crop but could be brought to the fruiting stage much earlier than usual.

In view of the success of the experimental work a special neon lamp for greenhouse work is now being manufactured. The equipment consists of neon tubes which are housed in elongated narrow reflectors. The reflector casts the light on the plants, and by varying the height of the reflector above the plants the correct light intensity is obtained. The equipment can be used at a distance of from 2 to 7 ft. from the plants according to whether a weak, medium, strong, or very strong intensity is required.

Electric heat for propagating and growing plants, B. D. MOSES and J. R. TAVERNETTI (*California Sta. Circ.* 335 (1934), pp. 18, figs. 17).—Practical information is presented for use both by engineers and laymen on the use of electricity for heating hotbeds and regarding the equipment necessary. It is based on studies conducted by the station in cooperation with the California Committee on the Relation of Electricity to Agriculture.

[A five year bibliography of the theory of refrigeration, refrigerants, and appliances, 1929–1933, and of the applications and testing of refrigeration, and of its British patents, 1929–1933], compiled by H. T. PLEDGE (*London: Sci. Mus., So. Kensington*, 1934, [pt. 1], pp. 97; [pt. 2], pp. 78).—The first of these bibliographies is concerned chiefly with the theory and appliances of refrigeration. The second deals with the applications of refrigeration and the testing of its effects.

Development of dairy machinery, H. J. HOFFEN ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [Roma], 25 (1934), No. 4, pp. 161–165).—Data are presented and discussed on the manufacture, export, and import of dairy machinery, including cream separators especially, in the various countries of the world during the years 1928–32.

The mechanical aeration of sewage by Sheffield paddles and by an aspirator, H. E. BABBITT (*Ill. Engin. Expt. Sta. Bul.* 268 (1934), pp. 56, figs. 21).—Tests are reported the purpose of which was to measure the efficacy of the Sheffield paddle aerator and to study aspirating devices for aerating sewage in the activated sludge process of sewage treatment. An air diffusion aerator was used as a check upon some of the results obtained from the aspirator.

It was found that satisfactory activated sludge can be formed and an effluent of desired quality can be obtained by thorough agitation of sewage in shallow tanks by means of Sheffield paddles. Under proper conditions the method of aeration is highly satisfactory. Satisfactory aeration is obtained, with the lowest expenditure of power, by submerging the paddles from 6 to 9 in. in the mixed liquor. Under-aerated and bulking sludge, a low biochemical oxygen demand modulus, mechanical difficulties, and inefficient pumping equipment all point to the conclusion that the circulation of sewage through an aspirator by means of a pump which must lift the sewage into the aspirator head is not a successful method of sewage treatment. Aeration of sewage through an aspi-

rator is mechanically efficient and biologically and chemically satisfactory when the equipment is arranged with two or more aeration tanks and aspirators in series.

AGRICULTURAL ECONOMICS

Economics with applications to agriculture, E. F. DUMMEIER and R. B. HEFLEBOWER (*New York and London: McGraw-Hill Book Co., 1934, 1. ed., pp. X+742, figs. 60*).—This is a college textbook planned for "general courses in economics in an environment in which agriculture is important, or in situations in which the instructor wishes to develop the principles of economics through the problem method of approach." Its objective is to present the generally accepted principles of economics and their application to the present problems of agriculture. The several chapters cover economic problems of agriculture; the European background of modern economic life; American economic development; production and business organization; the law of diminishing returns; some principles of trade and production; farm organization; exchange value and the market; demand, supply, and market price; cost of production and price; effects of monopoly, public authority, and custom on price; monopoly and agriculture; money and credit; price-level movements and agriculture; labor and wages; capital and interest; land returns and land values; risk, risk bearing, and profit; international trade and agriculture; the tariff and the farmer; taxation and the farmer; agricultural credit; transportation and other public utility problems; marketing and cooperation; land utilization; business cycles and depressions; rural and urban prosperity; the farm problem and the Government; economic control under the New Deal; and capitalism and its critics. Questions and problems and a list of suggested readings are included for each chapter.

Farm management crop manual, compiled by R. L. ADAMS and L. A. CRAWFORD (*Berkeley, Calif., 1933, pp. 4+200*).—This mimeographed manual was compiled "for the use of farm managers, appraisers, investigators, students, and others who may have need of a collection of pertinent crop data applicable to farm organization and management in California, so that they may better study the income possibilities and financial requirements of various farm enterprises." The major producing areas in California of the principal field, fruit, and truck crops are indicated, and data are presented, chiefly in tabular form, as to yields and selling prices of crops, different items of costs of production, costs of production of different crops, etc.

Current Farm Economics, Oklahoma, [October 1934] (*Oklahoma Sta., Cur. Farm Econ., 7 (1934), No. 5, pp. 77-95, figs. 2*).—Included are statements regarding the general agricultural situation and the cotton situation, by L. S. Ellis (pp. 79-83), the wheat situation, by R. A. Ballinger (pp. 83, 84), and the animal products supply situation, by P. Nelson (pp. 84-87). Short articles are included entitled The Farm Credit Situation in the Light of Recent Developments, by Ellis (pp. 87-91), and Some Immediate Readjustments to be Made in the Farmer's Standard of Living, by O. D. Duncan (pp. 91-93).

Types of farming in Idaho.—I, Agricultural resources and factors affecting their use, H. A. VOGEL and N. W. JOHNSON (*Idaho Sta. Bul. 207 (1934), pp. 60, figs. 36*).—This bulletin, prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is the first of a series. It is based primarily on data from the 1930 U. S. Census of Agriculture. Maps and charts with interpretative text show, usually by counties, the ownership of

the land resources; percentage of land in farms; number, location, and size of irrigated and nonirrigated farms and variations in size of such farms; changes, 1920, 1925, and 1930, in the percentage of farm area utilized by farms of different sizes; percentage of land cultivated and tillable in 1929; changes from 1919 to 1929 in cultivated area per farm; predominant types of pastures in 1929; relative importance of different irrigated crops; geographical distribution of chief crops, 1929, and kinds of livestock on January 1, 1933; changes in acreage of major field crops, 1919-29; acreages, 1919 and 1929, in different fruits; proportion of various types of livestock on farms, January 1, 1932; general grazing and feeding areas for beef cattle and sheep; changes in the number of various classes of livestock from January 1, 1922, to January 1, 1934; value per acre of land and implements and machinery; average annual and monthly rainfall; average range in normal and extreme temperatures, by months; number of frost-free days at selected stations, by years 1913-32; distribution of population, 1930; and changes in rural population between 1920 and 1930.

An economic survey of agriculture in the eastern counties of England, 1931, 1932, 1933 (*Cambridge Univ. Dept. Agr., Farm Econ. Branch Rpts. 19 (1932) pp. VII+89, figs. 2; 21 (1933), pp. VI+89, figs. 4; 22 (1934), pp. VI+77, figs. 8*).—This series of reports, which set forth the results of annual surveys made in the six counties forming the principal grain growing districts of England, are based upon records obtained from over 1,000 farmers each year. Each report discusses the weather conditions and prices during the year that it covers.

No. 19 is largely descriptive in character and includes chapters discussing the general, size group, and locality group averages; analyzing the data, usually by size of farm groups, regarding different crops and kinds of livestock and different costs (labor, feeding stuffs, livestock, rent, fertilizers, seed, and miscellaneous); and giving data as to equipment, size of fields, drainage, private drawings in kind, vocational experience of occupier, cooperation, and farm accounts. It also discusses the effects of efficiency in the use of labor, rate of capital turn-over, efficiency in livestock production, value of output, and the interpretation of farm accounts.

No. 21 summarizes the data on farm capital, gross income, wheat "deficiency payments", gross charges, net return, gross output, social or net output, etc.; describes the economic organization of farming in the various sections of the area and some outstanding successful farm organizations; discusses size of holdings, small holdings, mechanization, specialization, and enterprise costs of production; and includes data as to unemployment in agriculture, tractors, motor vans, fixed engines, size of fields, mole drainage, ownership of holdings, the effects of age of occupier on profits, secondary business interests of occupiers, and farmers keeping accounts.

No. 22 summarizes the financial and economic data for the year, describes some profitable and some unprofitable farm organizations, and includes data on size of farm and crop yields per acre, lime deficiency, age of occupiers and length of experience and tenancy, birthplace of occupiers, and wireless owners and broadcast preferences.

Part-time farming for income, R. L. ADAMS and J. L. WANN (*California Sta. Bul. 581 (1934), pp. 46, fig. 1*).—This bulletin was prepared "to guide the prospective part-time farmer by pointing out the mistakes made by misinformed purchasers and by indicating something of the status and possibilities of part-time farming." It is based on records obtained from 81 part-time

farmers within the communities contiguous to San Francisco Bay and 76 such farmers in areas contiguous to Los Angeles.

Analysis is made of the principal commodities produced; the organization of the farms, including frequency and intensity of enterprises, types of farming, size of farms, sources of income, farm contributions to family living, amount of sales, methods utilized in selling products, cash expenditures, net income, labor contributed by operator and family, etc.; the acquisition of the farms, including year of purchase, purchase price, initial payments, mortgage indebtedness, interest rates, taxes, rental value of dwellings, types of dwellings, etc.; and of personal data concerning the farmers, including age, nationality, size of family, experience in farming and other occupations, outside earnings, reasons for engaging in and quitting part-time farming, disadvantages of part-time farming, etc. A number of suggestions and recommendations are made for the guidance of persons contemplating engaging in part-time farming.

Bibliography on land settlement, with particular reference to small holdings and subsistence homesteads, compiled by L. O. BERCAW, A. M. HANNAY, and E. M. COLVIN (*U. S. Dept. Agr., Misc. Pub. 172 (1934), pp. IV+492*).—This is a collection of references to publications, most of which are in the files of the Library of Congress and the library of this Department, on land settlement in the United States and in foreign countries which are likely to be useful to those interested in the literature of subsistence homesteads, small holdings, and land settlement as relief for unemployment. It covers small holdings, allotment gardens, garden cities, soldier settlements, part-time farming, decentralization of industry, irrigation and reclamation projects, and the present-day back-to-the-land and subsistence homestead movements. References to war-time allotments, the cultivation of vacant lots to increase production in war time, and labor, penal, correctional, welfare, and other institutional farm colonies have been omitted. No systematic search was made for references to legislation.

Part 1 (pp. 3-16) includes general references to land settlement and to land settlement in the United States and in foreign countries. Part 2, land settlement in the United States (pp. 16-200), is subdivided into reclamation and irrigation settlements, soldier settlement, back-to-the-land movement, 1931-33, decentralization of industry, Henry Ford's farm-factory plan, and States, alphabetically arranged. Part 3, land settlement in foreign countries (pp. 201-419), is arranged by countries alphabetically.

A critique of land tenure research, M. M. KELSO (*Jour. Land and Pub. Util. Econ.*, 10 (1934), No. 4, pp. 391-402).—The tenancy situation in the United States, present research in land tenure, the bases for classification of land tenure, and the subjective and objective factors of land tenure patterns are discussed. The degree of freedom of management possessed by the individual—a basis of man's relation to man—is set forth as a better basis of classification of persons making up the tenure pattern than is their relation to the land—a legal concept. The methods of making studies under the former basis are outlined.

Farm real estate values in Minnesota, E. C. JOHNSON (*Minnesota Sta. Bul. 307 (1934), pp. 8, fig. 1*).—Tables present, by counties, the value per acre of farm real estate as shown by the Federal Censuses, 1870-1930, and the average sale price per acre of farm real estate, by 2-yr. periods from 1910-11 to 1932-33, based (except 1932-33) on data obtained from county records by the Minnesota Tax Commission. The indexes (1912-13=100) of sale values are also shown for each of the six districts of the State.

Semi-annual index of farm real estate values in Ohio, January 1 to June 30, 1934, H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 74 (1934), pp. [4]*).—This is a continuation of the series previously noted (E. S. R., 71, p. 717).

Cost of producing farm crops in eastern Canada, E. S. HOPKINS, J. M. ARMSTRONG, and H. D. MITCHELL (*Canada Dept. Agr. Bul. 168, n. ser. (1934), pp. 51, figs. 13*).—This is a revision of the bulletin previously noted (E. S. R., 63, p. 385). The discussion of costs of production covers the 8 yr. 1923–30 and includes some additional crops. The material on farm tractors is based chiefly on 308 replies to a questionnaire on the situation in 1930.

A survey of the cost of producing potatoes in the Shafter-Wasco district of Kern County, A. SHULTIS (*Berkeley: Calif. Univ., Agr. Ext. Serv., 1934, pp. 8*).—Tables are included showing the costs in 1933 per acre and per 100 lb., by items, for each of 11 potato enterprises, and the average labor, material, cash overhead, and investment, depreciation, and interest on investment costs, by items. A table showing an estimate of costs in 1934 is also included.

Cost and efficiency in prune production in western Oregon, H. D. SCUDDER and R. S. BESSE (*Oregon Sta. Bul. 292 (1931), pp. 95, figs. 32*).—Three hundred and seventy-five yearly records covering the years 1923–26 were obtained from 155 prune farms. The records are analyzed to show the cost of production of prunes, total and cash, the variations in such costs, the cost of drying prunes, the fixed and seasonal costs, and the profits and losses in prune growing. Other analyses are made to ascertain the effects on costs and profits of yields, size of orchard, labor requirements and efficiency, drying efficiency, and grade and price of fruit. The present organization of the prune farm is discussed, and adjustments in organization are suggested. The present situation of prune growing in western Oregon is described and the future of the industry discussed briefly.

The average bearing prune orchard of 23 acres was found to be carrying an investment of \$471 per acre, of which \$463 was the appraised value of the orchard itself. During the 4 yr. (2 normal crops, 1 light, and 1 heavy crop) the average yield per acre was 1,836 lb. The average cost of production for the different years ranged from 4.37 ct. per pound to 8.81 ct., averaging 6.25 ct. per pound, of which 45 percent was for labor and 27 percent for interest on investment. The cash cost amounted to 50 percent of the total cost. The fixed costs amounted to 49 percent, preharvest costs to 16 percent, and harvest costs to 35 percent of the total costs. The average price received for all prunes during the period was 5.75 ct. per pound. Forty-three percent of the records showed costs of production less than the price received.

Over the 4-yr. period the enterprise as a whole paid all cash costs and depreciation and earned good wages for all direct labor on prunes of the operator and his family and 3.15 percent interest on the investment for prunes. About 35 percent of the farms showed a profit above total cost after allowing good wages for all labor and 5 percent on the investment for prunes. Ten percent of the farms failed to get back even cash expenditures, and 43 percent had from moderate to severe losses.

Yield was the most important factor affecting costs and profits. With a price of 8 ct. per pound, only 1,200 lb. per acre are required to pay cost of production, while 3,500 lb. are required with a price of 5 ct. per pound. An average yield over a period of years of 1,500 lb. or more of dried prunes is necessary to justify the use of land for prunes. Age of orchard was not an important factor in yield, paying yields being obtained usually from orchards

6 yr. old, although generally orchards do not reach full bearing until 12 or 15 yr. old.

The study indicated that 20 acres of prunes is a satisfactory economic unit on a diversified farm and 40 acres for a specialized prune farm. Labor distribution was a striking weakness in the prune enterprise as a specialized type of farming. Efficiency of labor inside the drier and type of drier had a marked effect on costs and grade of prunes on prices received.

Diversification is the outstanding need on most western Oregon prune farms. A study showed that the group of operators with the highest average farm incomes and composed of operators of diversified prune farms had only 16.5 percent of their time during the year unoccupied in direct labor, while the group of operators with the lowest incomes and composed of operators of specialized prune farms had 84.8 percent unoccupied.

The future for prune farming "appears to be a period of continuing severe competition. Three ways of meeting this competition successfully are suggested: (1) Through reduction of the cost of producing prunes; (2) through better organization of the prune farm as a whole; (3) through development of a marketing organization that will handle the entire Northwest crop. With reasonably low cost of production—good land, good cultural methods, efficient operation, and a diversified farm organization—it is believed the low-cost producer can meet competition successfully and find in the Oregon prune a profitable, permanent enterprise."

Cost of producing queen and package bees in California, R. L. ADAMS and F. E. TODD (*California Sta.*, 1933, pp. 8+[6]).—This is a study made in cooperation with the Pacific Coast Bee Culture Field Laboratory, Bureau of Entomology, U. S. D. A., of the cost of producing queen and package bees in California.

An analysis of the operations of the Hayward Poultry Producers' Association, J. M. TINLEY and J. B. SCHNEIDER (*California Sta.*, 1934, pp. 39, figs. 5).—The organization, development, business operations, policies, financial condition, operating efficiency, legal problems, etc., of the association are described and analyzed, and suggestions made as to changes in policies and operations.

Amounts and kinds of feed fed to Michigan dairy cows, E. B. HILL (*Michigan Sta. Spec. Bul.* 250 (1934), pp. 22, figs. 8).—The data presented are compiled from the Dairy Herd Improvement Association annual summary sheets for the years 1927–30. Of the records, 3,156 were for Holstein and 3,557 for Jersey and Guernsey cows. In making the analysis the cows were grouped as to whether Holsteins or Jerseys and Guernseys, annual milk production, whether or not a significant amount of succulent roughage was fed, and as to whether in southern Michigan, northern Michigan, or the Upper Peninsula.

The average weights of the cows were greater in the higher production groups. In the higher production groups cows were pastured fewer days and a higher percentage of the cows were fed alfalfa hay than in the lower production groups. The amount of concentrates fed per cow increased more than the amounts of succulent and dry roughage as production per cow increased. The amount of roughage fed per unit of production decreased as total production per cow increased. Feed costs per pound of butterfat were nearly 30 percent higher for cows producing approximately 175 lb. per year than for those producing 325 lb. per year. Costs continued to decrease, but at a slower rate, up to a production of about 500 lb. of butterfat per year. The feed costs per 100 lb. of milk were somewhat less for Holsteins than for Jerseys and Guernseys. Such costs per pound of butterfat were somewhat higher for the Holsteins.

An economic study of the collection of milk and cream in Maine, G. F. Dow (*Maine Sta. Bul. 373 (1934), pp. 109-145, figs. 7*).—"This study includes a presentation of important changes that have occurred in the collection of milk and cream in Maine from 1928 to 1932, and an analysis of the factors that affected the cost of collection during 1930-31. The data for 1928 were based on records of 6,580 dairymen, who included all farmers who delivered milk or cream to the larger dairy dealers in Maine. The information for 1930-31 was secured from 1,802 dairymen, each of whom sent in a complete reply to a questionnaire pertaining to his collection of milk or cream."

From 1928 to 1933 the number of plants of larger dealers in the State decreased about one-third. Plants receiving milk for out-of-State shipment decreased from 23 to 8 and the number receiving cream decreased nearly one-half. The average frequency of delivery to country receiving plants increased from 4.1 times per week in 1928 to 6.5 times for milk in 1930-31 and from 2.6 times per week in 1928 to 3 times for cream in 1930-31. In 1928, 35.4 percent of milk was delivered by hired collectors and 24 percent by railroad, as compared with 76.2 and 1.4 percent, respectively, in 1930-31. The percentages for cream were 46.2 and 20.2, respectively, in 1928 and 70.9 and 8.7, respectively, in 1930-31.

In 1928 the average hauling distance for milk was 3.3 miles and for cream 5.2 miles. In 1931 the average distances were 12.5 and 14.3 miles, respectively. The average distances in 1930-31 were 3.1 miles for farmers hauling independently, 4.3 miles for dairymen who exchanged hauling, 14.4 miles for hired collectors, and 23.3 miles for railroad shipment.

The average costs of collection, including hired collection, railroad shipment, and delivery by dairymen themselves, in 1930-31 were 35 ct. per 100 lb. for milk and 92 ct. for cream. Hired collectors hauled milk about 30 percent more economically than individual dairymen for distances of less than 3 miles and 55 percent more economically for distances of 6 to 8.9 miles. When 2 or 3 dairymen exchanged hauling, the costs were reduced 29 percent for milk and 20 percent for cream. When 3 or more exchanged, the reductions were 56 and 53 percent, respectively. On three-fourths of the collection routes a uniform rate was charged regardless of distance, and on only about 5 percent of the routes was there a rate adjustment made to those producers having larger than average volume of milk or cream.

The average costs for hauling by individual farmers increased from 27 ct. per 100 lb. for milk and 79 ct. for cream for distances of less than 3 miles to 67 ct. and \$1.57, respectively, for distances of 6 to 8.9 miles. Hauling costs averaged 5 ct. per 100 lb. for milk and 21 ct. for cream less for producers living on improved roads than for those living on unimproved roads. Hauling costs were only 29 ct. per 100 lb. of milk and 68 ct. for cream in concentrated dairy areas, as compared with 41 and 95 ct., respectively, in the least concentrated areas.

Costs and returns in operating milk and cream collection routes in Maine, G. F. Dow (*Maine Sta. Bul. 374 (1934), pp. 147-189, figs. 6*).—Analysis is made of the costs and returns on 90 collection routes during the year ended June or July 1932.

Of the total trips made, 92.2 percent were with trucks, 5.7 percent with horses and trucks, and 2.1 percent with horses alone. The average annual cost of operating motor trucks was \$925, or 4.8 ct. per mile. The cost per mile decreased from 5.52 ct. for trucks used for less than 15,000 miles during the year to 4.25 ct. for those used for 25,000 miles and over. The total cost of operating collection routes averaged \$1,225, of which 60.6 percent was for the use of motor trucks, 35.9 percent for collector's labor, and 3.5 percent for extra

man and horse labor. The average cost per 100 lb. was 18 ct. on milk routes, 50 ct. on cream routes, and 23 ct. on all routes. The average amounts received by collectors per 100 lb. were 27, 70, and 34 ct., respectively. The average labor returns to collectors were 53, 45, and 52 ct. per hour, respectively. Costs per 100 lb. on all routes decreased from 47 ct. where less than 1,000 lb. were hauled per trip to 14 ct. where 3,000 lb. or over were hauled per trip. Labor returns per hour increased from 35 to 67 ct., respectively.

Volume per mile and miles per trip accounted for 83 percent of the variations in cost per 100 lb. for collection, volume being the more important. The average collection costs increased from 6.5 ct. per mile on routes 70 miles and over in length to 9.7 ct. per mile on routes less than 30 miles long. They were 9 ct. on routes with relatively poor roads and 7.2 ct. on those with better roads. The average distance traveled per trip was 52 miles and the average time per trip in the summer 6.6 hr., of which 33 percent was used in loading at the farm, 53 percent in traveling, and 14 percent at the receiving plant.

Financial operations of Ohio farmer owned elevators during the fiscal year 1933-34, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 75 (1934), pp. [1]+14*).—This is the sixth number of the series previously noted (E. S. R., 71, p. 719).

Cotton under the Agricultural Adjustment Act, H. I. RICHARDS (*Washington, D. C.: Brookings Inst., 1934, pp. VIII+129+[4], figs. 3*).—This is the fourth of the series previously noted (E. S. R., 72, p. 268). It covers the developments up to July 1, 1934, in chapters on the cotton situation, May 1933, Government offers, administrative organization, the sign-up campaign, the plow-up campaign, effect of program on 1933 production, effect on farm incomes, increase in 1933 farm income in the South, cost of the 1933 program, cotton options, the ten-cent cotton loans, processing and compensatory taxes, summary statement, foreign loans and emergency relief purchases, the 1934-35 program, and compulsory control.

Farm price of cotton in relation to quality.—A progress report, C. E. ALLRED, G. H. HATFIELD, and P. B. BOYER (*Tennessee Sta. Bul. 153 (1934), pp. 32, figs. 11*).—This is a progress report of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. It is based on 13,420 purchases of single bales of white and spotted cotton sold in 1 to 7 local markets during the years 1928-29 to 1931-32, inclusive, and data supplied by the Mid-South Cotton Growers Association as to prices paid for 20,212 bales of such cotton purchased by it. Samples from the purchases in the local markets were classified by the U. S. Department of Agriculture classifiers. The grades and staple lengths of the cooperative purchases were determined by the association.

Tables and charts show for the single-bale and cooperative purchases the grade and staple length distribution and the average premiums and discounts in the Memphis and local markets and paid by the association for different grades and staple lengths. Other tables and charts show like data for some of the individual markets and the daily price variations in the price for cotton of the same quality in some of the local markets. Type of market as a price factor and point buying are discussed briefly, and some suggestions are made for the improvement of local market prices.

The average premiums above and discounts for white cotton from the price for middling cotton paid in the central and local markets and by the Mid-South Cotton Growers Association were, respectively, for good middling +0.44, +0.02, and +0.3 ct., strict middling +0.26, +0.01, +0.25 ct., strict low middling -0.43, -0.09, and -0.34 ct., and low middling -1.3, -1.07, and -1.29 ct.

The percentages that the grower actually received of the equitable share of the respective grades in the total amount paid for all white and spotted cotton were: White cotton middling fair 94.3, strict good middling 91.2, good middling 97.4, strict middling 99.5, strict low middling 103.7, low middling 97.4, strict good ordinary 104.9, and good ordinary 117.1; and spotted cotton good middling 99.1, middling 103.9, strict low middling 103.9, and low middling 106.6.

The average staple-length premiums and discounts (base= $\frac{7}{8}$ -in. white cotton) in the central and local markets and paid by the cooperative association were for shorter than $\frac{7}{8}$ in., -0.98 , -0.3 , and -1.24 ct.; $\frac{1}{8}$ in., $+0.25$, $+0.03$, and $+0.32$ ct.; 1 in., $+0.61$, $+0.05$, and $+0.6$ ct.; and $1\frac{1}{8}$ in., $+1.11$, $+0.09$, and $+0.95$ ct. The total differences between the actual amount paid growers and the ideal proportion amounted to 1.78 percent for staple length and 1.16 percent for grade.

Quality of cotton produced in New Mexico, 1928-1932, J. R. KENNEDY and J. C. OVERPECK (*New Mexico Sta. Bul.* 225 (1934), pp. 27, figs. 8).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Tables and charts are included and discussed showing (1) for each of the 5 yr. the percentages of the cotton ginned in New Mexico, the Mesilla and Rincon Valleys (Dona Ana and Sierra Counties), and the Pecos Valley (Chaves and Eddy Counties) that were of different grades and staple lengths; (2) the average percentages, 1928-32, of cotton ginned in the United States and New Mexico of different grades and staple lengths; and (3) the average percentages, 1928-32, of cotton ginned in New Mexico prior to October 1, during October, during November, December 1 to January 15, and after January 15 of different grades and staple lengths. The general organization for the production and distribution of pure seed is described briefly.

Cotton represented about 42 percent of the total cash income from all farm crops in New Mexico for the 5-yr. period, 1928-32. Of the cotton ginned in New Mexico during the period, 56 percent classed as strict middling and above and 83 percent of the staple was 1 in. and longer, as compared with 39 and 24 percent, respectively, for the United States. Practically all of the New Mexico cotton ginned $1\frac{1}{8}$ in. and longer graded middling or above. More than 90 percent of the New Mexico cotton was tenderable on future contracts. Of the cotton ginned prior to November 1, an average of 54 percent was good middling or better and 90 percent strict middling or better. Very little was spotted or colored. Most of the $1\frac{1}{8}$ in. and longer cotton was ginned prior to November 1. The average staple length decreased gradually during October and November and very pronouncedly after December 1.

Grades averaged slightly higher and staples almost $\frac{1}{8}$ in. longer in the Mesilla Valley than in the Pecos Valley. The average staple length of $1\frac{1}{2}$ in. for the State was made possible by the production and distribution of seed of one variety, Acala.

Cotton production in the Anglo-Egyptian Sudan, P. K. NORRIS (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F. S.* 62 (1934), pp. [2]+18, figs. 5).—The area and its population, climate, agriculture and commerce, and the development of cotton production in the several districts are described.

Relation of quality to the retail price of eggs in New York City, A. R. GANS ([*New York*] *Cornell Sta. Bul.* 597 (1934), pp. 52, figs. 21).—This study was made "to determine some of the quality factors which influence the consumer demand for eggs, to measure quantitatively the relationship of these factors to the retail prices actually paid for eggs in the market, and to determine the extent to which the present New York grade requirements reflect the consumer preferences for various quality factors."

Data collected by official inspectors of the dairy and food bureau of the State department of agriculture and markets of New York for the New York metropolitan area were used. These included records of 2,060 doz. eggs obtained from December 9, 1930, to April 24, 1931, and records of 886 doz. obtained for the period February 1 to April 28, 1932. Analyses based on cross tabulations were made of the relations between prices and color of shell, cleanliness, and uniformity of shape of shells, type of container, grade mark on container, weight per dozen, weight per dozen and shell color, range in weight in the dozen, range in weight and type of container and total weight, depth of air cell, candler's scores of air cell, white, and yolk, and number of eggs per dozen with germ development, blood and meat spots, or inedible.

Other tables show the interrelationships between the various scores of the interior condition of the eggs and of a composite index of the interior condition and price, shell color, weight of eggs, and depth of air cell. Multiple correlation analysis was made of the relationship to prices of number of white shells per dozen, number of dirty shells per dozen, weight per dozen, depth of air cell, and index of interior condition. Coefficients of curvilinear and joint relationships between weight, interior condition, and price were determined by the use of contour lines. Other tables and charts also show the effects of the grade of individual eggs and of the dozen and the relation of grade on carton and composite index of interior condition of the eggs on prices received. Some of the findings were as follows:

In general, white eggs sold from 3 to 5 ct. per dozen higher than brown eggs, and brown eggs from 1 to 4 ct. per dozen higher than mixed-color eggs. Eggs of high quality, however, brought approximately the same price regardless of shell color. Eliminating the influence of size, interior condition, depth of air cell, and shell color, each dirty egg reduced the price per dozen approximately 0.6 ct. Eggs uniform in shape brought a premium of about 3 ct. per dozen, but no premium was paid for uniformity in size. The premium for eggs in cartons was equal approximately to the cost of the carton in 1930-31, but did not cover such cost in 1932.

Consumers apparently very definitely associated the grade marks B and C with low-quality eggs. Eggs in cartons without a grade mark brought an average price higher than similar eggs in cartons carrying B or C grade marks. Depth of the air cell and the candler's score of the interior condition were closely related, but for eggs of a given interior condition there was little relationship between the depth of air cell and price. As the number of eggs per dozen with slightly tremulous air cells, firm and clear whites, or visible yolks increased, the prices paid increased, but at a steadily decreasing rate. On the basis of the combined index of interior condition, eggs of the highest grade brought a premium of 12 ct. per dozen in 1930-31 when the price of eggs averaged 41 ct. per dozen and a premium of 10 ct. in 1932 when the average price per dozen was 27.5 ct. The average interior condition of the brown eggs was lower than that of the white eggs and higher than that of the mixed-color eggs. In general, a given percentage change in weight affected the price more than a like percentage change in the interior condition, but the price varied more consistently with interior condition than with size.

The correlations of price, number of dirty shells per dozen, weight (ounces per dozen), air cell (eighths of an inch), and index of interior condition, using the 1930-31 records, showed the following percentages of variability in price were accounted for by the four factors: White eggs, using individual records, 15, and using group averages, 34; brown eggs, using individual records, 35, and using group averages, 74. The correlations of price, weight, and index of inte-

rior condition showed 32 percent of the variability to be accounted for by these two factors in the case of white eggs and 72 percent in the case of brown eggs. The relationships of these two factors to price were also found to be curvilinear and joint.

In general, relatively little premium was paid for size if interior condition was low, or for interior quality if size was small. As these factors increased above the average, the premiums decreased. Consumer demand for quality apparently was not reduced in proportion to the average decline in prices for 1930-31 to 1932. Inspector's grade of the dozen was not closely related to price, due primarily to the grade standards regarding uniformity in size and regarding tolerances, which resulted in many dozens being classed as grade C even when the quality of the eggs equalled others meeting grade A requirements. From the relationships between quality and price, it appears that the classification of eggs into more than four grades is justified. Grades on containers had an important influence on price.

Monthly index numbers of farm prices, California, 1910-1934, H. J. STOVER and D. R. RUSH (*California Sta. Bul. 569, Sup. (1934), pp. 17*).—This is a supplementary report to Bulletin 569 of the station, previously noted (E. S. R., 71, p. 415). The commodities included in the monthly indexes are beef cattle, veal calves, hogs, sheep, lambs, milk, milk fat, butter, eggs, chickens, wool, horses, barley, wheat, oats, corn, hay, alfalfa, cotton, potatoes, beans, oranges, lemons, and apples. Tables show the monthly index numbers, January 1910 to August 1934, inclusive, for the following groups of the 24 commodities: All commodities, livestock and livestock products, meat animals, dairy products, poultry products, grains, field crops other than grains, and fruits. Other tables compare the farm prices of the several commodities and groups in August 1932, 1933, and 1934 and the averages for the periods 1910-14 and 1924-28. Comparison is also made of the annual indexes for the 35 commodities included in Bulletin 569 and the annual averages of the monthly indexes of the 24 commodities included in the present report.

Barley statistics with special reference to California, J. B. SCHNEIDER and D. W. SMYTHE (*California Sta., 1934, pp. 19, fig. 1*).—Included are tables giving statistics concerning barley production in the 10 leading producing nations of the world, the United States, and the 7 principal barley-producing States; California production, carry-over, exports, and consumption of barley; and the exports, domestic malting, and domestic feed markets for California barley.

California utilization of linseed oil and general economic facts relating to flaxseed, E. W. BRAUN (*Berkeley: Calif. Univ., Agr. Ext. Serv., 1933, pp. [2]+11, figs. 2*).—Tables are included showing the volume of linseed oil utilized in California, the world and United States production of flaxseed, imports into the United States, import duties, volume of linseed oil crushed in the United States, flaxseed prices at principal markets, and the relation of such prices to linseed oil and linseed meal prices.

Poultry statistics relating to the southern counties of California, E. C. VOORHIES (*California Sta., 1934, pp. 33*).—Included are tables showing the average monthly wholesale prices of different classes of poultry and of rabbits at Los Angeles; monthly farm prices in the United States and California of chickens and turkeys; cold storage holdings of poultry in the United States, the Pacific section of the United States, Los Angeles, and San Diego; receipts of dressed poultry at Los Angeles and the origin of such receipts; etc.

Egg statistics relating to the southern counties of California, E. C. VOORHIES and J. B. SCHNEIDER (*California Sta., 1934, pp. 73, fig. 1*).—This is

a compilation of economic information regarding eggs, relating specifically to southern California. Data are included as to specifications for different standards, prices in southern California cities, farm prices in California and States shipping eggs into southern California, receipts of eggs in and shipments from California, cold storage holdings, cost of poultry rations, egg-feed price ratios, volume of egg sales, retail prices in southern California, etc.

Fruits and vegetables received in trucks in the Columbus wholesale markets, 1929-1933, C. W. HAUCK (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul.* 72 (1934), pp. [1]+27, figs. 7).—This is a continuation of the series previously noted (E. S. R., 70, p. 554). The receipts for 1933 are set forth, comparisons made with previous years, and the trends shown.

Market distribution of car-lot shipments of fruits and vegetables in the United States, J. W. PARK (*U. S. Dept. Agr., Tech. Bul.* 445 (1934), pp. 30, fig. 1).—Analysis is made of available statistics, chiefly for 1930 and 1931, on the market distribution of car-lot shipments of fruits and vegetables. The relative importance of markets according to population, location, and commodity and the regularity of distribution, distance of origin of supply, relative importance of various commodities in the supply, etc., are discussed for the various markets. Tables and a map included and discussed show the location of producing areas and the principal markets, the fluctuations in daily market supplies as measured by price, the unloads per 100,000 population in various markets and groups of markets, and the variations in car-lot distribution among the markets from year to year and in composition of the fruit and vegetable supply in certain markets, and make comparisons of the season's supplies in different markets as measured by price and of various metropolitan districts as car-lot markets. Some data are included as to motor-truck movements of fruits and vegetables.

American cooperation (*Washington, D. C.: Amer. Inst. Coop.*, 1933, pp. X+588).—This is a collection of papers and discussions presented at the ninth summer session of the American Institute of Cooperation, held at Raleigh, N. C., July 24-29, 1933.

In addition to the opening addresses (pp. 1-26), approximately 50 papers with discussions are included on the place of cooperatives under the Agricultural Adjustment Act (pp. 27-85), new national credit policies and cooperation (pp. 87-140), current developments in cooperative buying (pp. 141-194), quality improvement (pp. 195-215), membership problems (pp. 217-236), problems in marketing livestock (pp. 237-258), poultry (pp. 259-281), dairy products (pp. 283-341), fruits and vegetables (pp. 343-404), cotton (pp. 405-473), and tobacco (pp. 475-533), and cooperative marketing activities of southern farm women (pp. 535-576).

Governmental costs and taxes in some rural New York towns, H. M. HAAG (*[New York] Cornell Sta. Bul.* 598 (1934), pp. 50, fig. 1).—Data covering the calendar year 1930 were obtained chiefly from financial records of the towns and county records for the 71 towns of Allegany, Chenango, Genesee, and Schuyler Counties, N. Y. The towns and the sources of their income are described. Analysis is made of town expenditures for different purposes, the county expenditures charged to towns, special district expenditures, variations in town-highway costs, costs of general government in towns, and the tax rates for the general fund and for the highway fund. Taxable wealth, value of taxable property per mile of highway, highway mileage, highway expenses, population, etc., are used as the basis of the analysis. The possibilities of changing town tax rates through changes in services, cost of performing units

of service, obtaining income from other sources than property taxes, and changes in the tax base are discussed.

The average expenditures per town increased from \$9,159 for towns with less than \$1,000,000 of taxable wealth to \$32,356 for those of \$3,000,000 and over of taxable wealth, averaging \$17,528. For all towns, 74.1 percent of the expenditures were for highways, 4.6 for welfare, 4.3 for debt service, 3.4 for special services, 3.2 for general administration, 2.3 for assessment of taxes, 1.8 each for elections and unusual expenditures, 1.4 each for health and buildings and equipment, and less than 1 percent each for protection, tax collection, vital statistics, and school attendance. As the wealth per town increased, the percentage for highways decreased and those for welfare and special services increased.

The town tax rate for all town funds increased from an average of \$2.41 per \$1,000 full value of taxable property in towns with \$5,000,000 or more of taxable wealth to \$15.89 for towns with less than \$500,000 of taxable wealth. The total taxes per capita increased from \$3.78 to \$11.56.

Rural tax delinquencies in California, G. M. PETERSON (*California Sta.*, [1934], pp. [36]).—This is a summary of the data on tax delinquencies collected by the Federal Civil Works Administration under the supervision of the Bureau of Agricultural Economics, U. S. D. A., and the Giannini Foundation of Agricultural Economics. Tables show among other things, by counties by years 1928–33, the total assessed valuation, total taxes levied, collected, and delinquent for all property and for properties 3 acres and over outside of cities; the number, acreage, average size, and assessed valuation of properties 3 acres and over delinquent and the amount of delinquency; and the number, acreage, amount of first delinquency, and redemption or purchase of properties 3 acres and over in size delinquent 5 yr. and deeded or subject to deed for taxes.

RURAL SOCIOLOGY

Population mobility in rural Connecticut, J. L. HYPES ([*Connecticut*] *Storrs Sta. Bul.* 196 (1934), pp. 72, figs. 13).—While the rural population of the United States declined 4.8 percent between 1920 and 1930, that of New England increased 1.9 percent. The process of urbanization has not proceeded uniformly, Maine, New Hampshire, and Vermont being much more rural, for example, than Massachusetts, Rhode Island, and Connecticut.

Mobility in Connecticut has two important aspects. The population of 14 suburban towns increased 50 percent, while 40 towns in the eastern and western highland regions lost population during the decade ended 1930. Thirty-three other towns in these two regions made a gain of 100 or less. The other aspect is the movement to and from the State. In 1930, of the 1,606,903 people constituting the State, 56.7 percent were born in Connecticut, 19.2 percent in other States, and 0.2 percent were born of United States parentage in outlying possessions, on the sea, or abroad, while 23.9 percent were foreign born. On the other hand, every State of the Union has received people born in Connecticut, the aggregate being equal to 20.8 percent of her present population. In 1930 there were enough greenhouse and other farmers living within the corporate limits of places having a population of 2,500 or more to constitute 0.9 percent of the entire population of New England. The rural nonfarm population of New England is sufficiently large to be important and is increasing, and in Connecticut it was roughly five times as great as the farm population.

The mobility of six towns was analyzed. Of residential moves, 61.3 percent were moves of residence without corresponding change in place or type of

work. The probability that the residence rather than the place or type of work will be changed is in the ratio of 1.6:1. Both residentially and vocationally, the full-time farmers are the most stable of all the groups classified, including part-time farmers, nonfarmers, and retired farmers.

Full-time farmers averaged 93.4 acres, part-time farmers 69.7 acres, nonfarmers 15.1 acres, and retired farmers 31.1 acres. Among the households having children, the full-time farmers led in average number of children per family, but over 40 percent of the childless families occur among the full-time farmers.

The amount of commuting seems least in the areas characterized by an important agriculture and greatest in areas where the agriculture is of a general subsistence or part-time nature. Of the 206 commuters, 55.3 percent have moved to these rural areas directly from the city. Group participation of commuters does not seem to have been affected seriously by change of residence. The best gross farm incomes were made by the part-time farm noncommuters (\$3,984), followed closely by the full-time farm noncommuters (\$3,910). Commuting under the conditions provided by Connecticut towns, however, furnishes a widely accepted and favorable means for economic and social adjustment.

The significance of the findings is discussed.

FOODS—HUMAN NUTRITION

Lane medical lectures: Biochemical studies of nutritional problems, J. C. DRUMMOND (*Stanford Univ. Pubs., Univ. Ser., Med. Sci., 3 (1934), No. 2, pp. 106, figs. 6*).—The five lectures given in the twenty-fourth course of Lane medical lectures April 3–7, 1933, are as follows: The Character of Modern Problems of Nutrition, The "Protein Factor" in Nutrition, The Nutritional Value of Fats, The Fat-Soluble Vitamins in Nutrition, and The Water-Soluble Vitamins in Nutrition.

[**Food and nutrition studies at the Florida Station**], O. D. ABBOTT, L. W. GADDUM, and C. F. AHMANN (*Florida Sta. Rpt. 1933, pp. 81–85*).—Included in this progress report are further findings in the previously noted studies on plant pigments as sources of vitamin A, effect of diet on worms in children, the glucosides of citrus fruits, and methods of preventing the development of rancidity in pecans and pecan oil (*E. S. R., 69, p. 303*), and preliminary findings in studies on the lecithin synthesis in hens on a vitamin A- and lipid-free diet, changes in the hematopoietic tissues of rats on a diet low or lacking in vitamin A, and the less common mineral constituents in the ash of citrus fruits.

Foods and nutrition (*Hawaii Sta. Rpt. 1933, pp. 23–26*).—This progress report (*E. S. R., 69, p. 747*) includes data on the iodine content of 30 samples of Hawaiian-grown vegetables and other food products, the sterol content and vitamin value of avocado oil, the vitamin B₁ content of fresh daikon (oriental radish) and commercial takuwan (daikon pickled in salt and rice bran), the composition and vitamin content of green soybeans, the vitamin C content of fresh pineapple juice, whole guava, and canned guava juice, the vitamin D content of various organs of the opihi (a Hawaiian shellfish), and the hemoglobin regenerating value of the opihi.

[**Studies in foods and nutrition at the Utah Station**], J. E. GREAVES, A. P. BROWN, and R. L. HILL (*Utah Sta. Bul. 250 (1934), pp. 44, 51, 52, 57, 58*).—Progress reports are given on an extension of the study of the nutritive value of high v. low calcium- and phosphorus-carrying wheat to attempts to equalize the nutritive value of Turkey and Kanred wheats by the addition of phosphorus to the latter, a comparison of height, weight, age data for rural school children with the Baldwin-Wood standards, and an extension of the

investigation on soft-curd milk (E. S. R., 65, p. 689) to studies of the chemical and physical differences between soft- and hard-curd milk and the relationship of soft-curd milk to subclinical mastitis.

Foods and drugs, J. M. BARTLETT (*Maine Sta. Off. Insp.* 151 (1934), pp. 28).—In this annual report on the results of the chemical examination of food and drug samples (E. S. R., 70, p. 128), tabulated data are given on the water and milk fat content of 98 samples of American cheese; the milk fat content of 150 samples of ice cream; and the content of water, sucrose, and invert sugar in 49 samples of molasses. Of 43 samples of blueberries sent to the station for analysis for arsenic, 31 were below or only slightly above the tolerance (0.1 grain per pound of fruit) and 12 contained from 2 to 3 times the tolerance.

[Meat cooking charts] (*U. S. Dept. Agr., Bur. Home Econ., Meat Cooking Charts 1-7* (1934), pp. 7).—This is a series of seven charts (size 20 by 30 in.) with the following titles: Do you know meat cuts and cook according to the cut, roasting a tender cut, stuffing low-priced tender roasts, broiling tender steaks and chops, pot-roasting a less-tender cut, braising a less-tender steak, and ground meat in savory ways. Each chart is illustrated with reproductions of photographs showing typical cuts and the main steps in the cooking process. These charts are not available for free distribution or individually, but are sold in sets by the Superintendent of Documents at a price of 50 ct. per set.

Changes in the pectic substances of fruits during storage, T. N. MORRIS (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 155-161*).—Preliminary comparisons were made of the color, flavor, and gel properties of jams and jellies prepared from raspberries, strawberries, gooseberries, and red and black currants in the fresh state and after storage for from 6 to 8 mo. at temperatures of -5° , -10° , and -20° C., with and without the addition of sugar or sugar sirup and preliminary heating at 90° for a few minutes. The effect of the addition of sulfurous acid, with and without preliminary heating and followed by storage, was also tested.

In general the best results both as to color and flavor and to jellying qualities were secured with storage of the untreated berries at -20° , and the poorest with treatment with sulfurous acid followed by storage at room temperature. Preliminary heating prevented the destruction of pectin by the sulfurous acid. Unsatisfactory results with respect to jellying properties were obtained in most instances with the berries which had been treated with sugar.

The preliminary tests were followed the next season by quantitative studies of the extent of destruction of pectin in gooseberries and raspberries after similar treatment and storage, as determined by measurements of the strength of the pectin gels by means of an apparatus which measures the force required to turn a noncorrodible metal spade through an arbitrary number of degrees when it is embedded to a standard depth in jelly set in a standard vessel at a definite temperature.

After 4 months' storage at -10° the loss of pectin, as thus determined, amounted to from 15 to 25 percent for the raspberries and about 35 percent for the gooseberries. Storage at -20° had no destructive effect on the pectin. At ordinary temperatures sulfurous acid completely destroyed the pectin and toughened the tissues, particularly the skin, of the gooseberries, but after preliminary heating and cooling before adding the sulfurous acid there appeared to be an increase in the pectin content of the materials stored for 4 mo., and there was no toughening of the skins. The results with strawberries were inconclusive. Increased pectin content was also noted in similar experiments

with apple pomace, and was found to be due to better extraction of the pectin and possibly to some improvement in its quality rather than to any alteration of pH in the finished jelly.

With fruits heated to destroy enzymes and stored at -5° the results were promising, although not entirely satisfactory as regards prevention of mold and complete preservation of pectin. It is thought that these slight changes could be entirely avoided by the use of slightly lower temperatures, such as -6° to -7° .

Gastric digestion of raw and boiled milk in infants, J. W. OLGIVIE and O. D. PEDEN (*Lancet [London]*, 1934, II, No. 2, pp. 76-78).—The effect of the boiling of cow's milk on its gastric digestion in infants was tested by the fractional test meal method on 17 infants from 3 to 23 mo. of age, using as indices of the course of digestion the amount of free HCl and total chlorine and the degree of total acid, peptic activity, soluble nonprotein nitrogen, and soluble calcium. The test food consisted of boiled or raw milk in amounts varying with the age of the subject, and the gastric contents were examined before and at half-hour intervals for 2 hr. after the feeding.

Although there were wide variations in results in the different subjects, there were no consistent differences attributable to the form of the milk. For instance, the amount of curd was more abundant with boiled milk in 9 cases and with raw milk in 7, and equal in amount in 1. In 13 tests with raw and 14 with boiled milk, there was obvious curd at the end of 2 hr., while in 4 with raw and 3 with boiled milk the 2-hour specimens were free from curd. There appeared to be a slight advantage for boiled milk over raw in the solubility of the calcium, but the maximum figures for raw milk ranged from 33.3 to 80.3 mg per 100 cc, with a standard deviation of 12.5 for raw milk and from 27.3 to 91.4 mg per 100 cc, with a standard deviation of 18.1 for boiled milk. Of the 24 pairs of half-hourly samples, half showed higher values for non-protein nitrogen with boiled and half with raw milk.

The authors conclude that digestion of milk is not adversely affected by boiling.

Functional efficiency and body-build in the young male adult, H. A. TREADGOLD (*Lancet [London]*, 1934, I, No. 26, pp. 1377-1382, figs. 11).—In this report the term functional efficiency is used to denote "(1) capacity to endure severe or prolonged physical stress; (2) capacity to endure severe or prolonged mental stress; (3) a high resistance to disease and a more rapid recovery rate than normal if any such disease is contracted." The term body build is used to express the relationship between age, height, and weight and is recorded in terms of weight with reference to normal standards. To study the possible connection between variations in body build and functional efficiency, the records of successful entrants to the Royal Air Force, England, both as airmen recruits for general service and as pilots, were examined, including the entrance records and the records for subsequent disease and invaliding. The conclusions of the report, which is illustrated by diagrams, are as follows:

"(1) There is a definite relationship between varying degrees of body build and functional efficiency, whether viewed from the points of capacity to endure severe or prolonged physical or mental stress or resistance to disease generally. (2) Capacity to endure severe or prolonged physical stress as evidenced by athletic prowess is found most commonly among overweights. An exception to this is seen in long distance athletes, among whom underweight is commoner than overweight. (3) Incapacity to endure severe or prolonged mental stress, as evidenced by invaliding from the service through psychic disorders, is commoner among individuals underweight on entry to the service than among

overweights. (4) This applies also to disease as a whole, and particularly in the case of infective diseases, such as pulmonary tuberculosis. The greater the degree of underweight on entry, the greater the likelihood of invaliding from the service on medical grounds. (5) It is uncommon for overweight individuals to become underweight and vice versa."

Body-build and functional efficiency (*Lancet* [London], 1934, I, No. 26, pp. 1399, 1400).—In this editorial comment on the investigation noted above, attention is called particularly to the disparity between the conclusions drawn with respect to underweight and the usual practice of life insurance companies, which consider overweight applicants a greater risk than underweight. "The suggested answer to this is that the poorer functional efficiency of the underweight person encourages him to lead a relatively sheltered life, and that the accompanying tendency to arterial hypotension provides a consequent immunity to some of the cardiovascular catastrophes of later life. From the point of view of sickness insurance, however, the underweight must compare unfavorably with the overweight in his greater liability to disease—a fact to which companies which specialize in sickness policies have not, so far as we are aware, paid any particular attention."

Protein, calcium, and phosphorus intakes of college women as indicated by nitrogen, calcium, and phosphorus outputs, M. M. KRAMER, H. F. EVERS, M. G. FLETCHER, and D. I. GALLEMORE (*Jour. Nutrition*, 7 (1934), No. 1, pp. 89-96).—In this contribution from the Kansas Experiment Station, the nitrogen, calcium, and phosphorus outputs of 25 college women on freely chosen diets during two periods of 4 days each were studied as an indication of protein, calcium, and phosphorus intakes.

The data, tabulated by subject in decreasing order of output per 70 kg body weight, show that in the fall period all but 7 of the subjects fell below the Sherman standard for protein, all but 2 were above the standard for calcium, and 14 were above and 11 below the standard for phosphorus. In the winter period all but 3 of the subjects were below the standard for protein, 3 were below for calcium, and 7 below for phosphorus. The average values for both calcium and phosphorus were well above the Sherman standard, but in both periods the average protein values, 62.8 and 60.7 g per 70 kg body weight, were below the standard.

Basal metabolism of old people, Y. KISÉ and T. OCHI (*Jour. Lab. and Clin. Med.*, 19 (1934), No. 10, pp. 1073-1079, fig. 1).—Basal metabolism data for 94 normal Japanese subjects whose ages ranged from 50 to 93 yr. are reported and compared with data for similar age groups as given in the literature. The age groups, with number of subjects in each and average basal metabolism values per square meter per hour, are as follows: For males, 50-59 yr., 13 subjects, and 36.05 calories; 60-69, 15, and 34.91; 70-79, 10, and 33.16; and 80-93 yr., 6 subjects, and 32.06 calories. Corresponding data for females were 54-59 yr., 8 subjects, and 34.02 calories; 60-69, 16, and 33.15; 72-78, 18, and 31.9; and 80-86 yr., 8 subjects, and 30.42 calories. These data, as well as data for individual subjects, show a gradual decrease in metabolism with age, amounting to from 3 to 5 percent in each 10-year group.

Prediction equations for estimating the heat production from the age of the subject have been calculated from the data and found to be as follows: For males $H=42.5042-0.1202 A$ and for females $H=40.2902-0.1086 A$ (H equals calories per square meter per hour and A age in years).

The graphs of calories per square meter per hour plotted against age showed on the whole the closest agreement with the data of Krogh, although the curve

for the male subjects was almost the same as that of Harris and Benedict for the age period of from 50 to 59 yr., and that of the females resembled closely that of Aub and Du Bois, although at a slightly lower level.

The content of free and bound cholesterol in various parts of the brain of normal and polyneuritic animals [trans. title], H. G. K. WESTENBRINK (*Arch. Néerland. Physiol. Homme et Anim.*, 19 (1934), No. 1, pp. 122-131).—Determinations of free and bound cholesterol in the brains of normal and polyneuritic pigeons and rats revealed no differences which could be attributed to vitamin B₁ deficiency, thus refuting the hypothesis that polyneuritic symptoms are an outcome of an abnormally high cholesterol content of the brain, a condition prevented by increasing the fat content of the diet.

Influence of mineral imbalance in the diet on the growth of the white rat and its chemical composition (Variations in potassium and calcium) [trans. title], L. ÉMERIQUE (*Bul. Soc. Chim. Biol.*, 15 (1933), No. 9, pp. 1221-1234).—After establishing a basal diet for rats considered adequate in every respect, including the proportion of mineral elements, alterations were made in the mineral composition by increasing the potassium or the calcium. Rats were kept on the various diets for 90 days, at the end of which they were sacrificed and the entire bodies minus the intestinal tract analyzed for the different mineral constituents.

The animals receiving an excess of potassium gained more in weight and those receiving an excess of calcium less than the normal controls. In the former (excess potassium), the ratios of Ca:P and Ca:K were lowered, and that of Ca:Mg remained unchanged. In the latter (excess calcium), the ratios of Ca:Mg and Ca:K were raised, and that of Ca:P was not changed. The absolute mineral composition was not changed appreciably in any of the rats.

Mineral composition of the white rat deprived of vitamin A: Influence of unbalanced mineral content [trans. title], L. ÉMERIQUE (*Bul. Soc. Chim. Biol.*, 15 (1933), No. 9, pp. 1235-1238).—In addition to a control group of rats on a complete diet, 3 groups received the same diet without vitamin A, 1 of them with no other change, another with 3 times as much calcium, and another with 6 times as much potassium as in the basal diet. The animals which died as a result of vitamin deficiency were analyzed as in the studies noted above.

Much greater changes in the mineral composition were noted than in the previous studies. The ratios of Ca:P, Ca:Mg, and P:K were very greatly increased, and that of Ca:K was almost doubled.

Influence of vitamins A and D on the frequency of tumors in the mouse [trans. title], E. HARDE and N. KOBOZIEFF (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 24, pp. 848, 849).—The preventive action of vitamins A and D on mammary tumors in the mouse was tested on two groups of female mice from 2 to 3 mo. of age. The first lot of 26 were from a strain in which carcinoma was extremely rare and the other of 63 from a strain in which it was frequent. The treatment consisted of a diet of yellow corn meal, calcium, fresh legumes, and water supplemented about twice a week by 2 drops of cod-liver oil per mouse. The controls received the customary diet of bread, grains, fresh legumes, and water.

During the 4 mo. of the experiment no mammary tumors developed in either the controls or experimental animals of the resistant strain. In the second group, 8 of the 63 treated animals developed mammary tumors as compared with 28 of the 61 controls. These figures point to a marked lowering in susceptibility to mammary adeno-carcinoma in mice in nonresistant strains submitted to preventive treatment with vitamins A and D and calcium.

The influence of vitamin A on the metabolism of the rat and the guinea pig [trans. title], A. CHEVALLIER and H. BAERT (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 25, pp. 1037-1039).—Basal metabolism determinations on white rats on a normal diet gave average values of 10.58 calories per kilogram for animals weighing from 70 to 90 g, 10.71 calories for those weighing from 90 to 140 g, and 8.05 calories for those weighing from 140 to 170 g. In comparison with these figures, animals from 70 to 90 g in weight which had been kept on a vitamin A-deficient diet until the appearance of definite symptoms gave an average value of 12.2 calories per kilogram, representing an increase of 13 percent over the value established as normal. Other animals were fed the normal diet supplemented with 2,000 U. S. P. units of vitamin A in 0.1 cc of oil daily. A group averaging from 90 to 140 g in weight had an average value of 8.966 calories per kilogram, another weighing from 140 to 170 g an average of 7.138, and a third weighing from 170 to 190 g an average of 6.883 calories per kilogram. These values represent a lowering of metabolism amounting to 16, 11, and 9 percent, respectively.

In 19 basal metabolism tests on a single 450-500-g guinea pig on a normal diet, the average basal metabolism was 5.627 calories per kilogram and in 50 tests on the same animal while receiving 10,000 units of vitamin A in 0.5 cc of oil daily, 4.55 calories per kilogram, representing a decrease of 15 percent. The conclusion is drawn that the absence of vitamin A in the diet increases and an excess decreases the basal metabolism, and that the decrease on excess vitamin A is greater the younger the animal.

Fat soluble vitamins.—XXXV, **The ophthalmogenic properties of certain rations low in vitamin A**, C. BAUMANN and H. STEENBOCK (*Jour. Nutrition*, 7 (1934), No. 1, pp. 41-50).—In this continuation of the series of studies noted previously (*E. S. R.*, 66, p. 491), a comparison of the effect of various factors on the production of ophthalmia in rats on a vitamin A-free diet is reported with the conclusion that "the physical qualities of a ration which may allow irritating ingredients to lodge in the eyes of an experimental animal are factors which should be given consideration in the production and possible cure of ophthalmia. As the incidence of ophthalmia frequently leads to a secondary effect on growth, the physical state of the ration may have an effect on growth as well. It is accordingly recommended that when rations low in vitamin A are to be used for assay purposes, they should be so treated by cooking, moistening, or otherwise as to allay their dust-producing properties. In addition, it follows from our observations on growth and the production and cure of ophthalmia that a basal ration consisting of cooked polished rice 80, heated casein 12, sodium chloride 1, calcium carbonate 1, and yeast, high in vitamin B, 6, constitutes an excellent basal ration for determining vitamin A in concentrates such as cod-liver oil and the like. This ration, furthermore, has the advantage of low cost, as its salt ingredients are especially inexpensive."

Studies on some new properties of carotene: Does there exist a local insufficiency of vitamins? [trans. title], S. BALACHOVSKI and F. RATCHEVSKI (*Bul. Soc. Chim. Biol.*, 16 (1934), No. 2, pp. 220-228).—To test the hypothesis that localized vitamin deficiencies may occur in the body, the eyes of 44 persons suffering from some form of eye disorder were treated by inunction with a colloidal solution of carotene in 5 percent alcohol. Case reports are given for 10 of these, illustrating cures of keratitis of varying severity, trachoma, and ulceration. Of the entire series the authors state that in the majority the lesions were ameliorated following a single treatment with the carotene.

It is noted that although the solutions of carotene used became decolorized rapidly they did not lose their therapeutic activity after decoloration, but on

the contrary appeared even more active. An analgesic effect was also observed in a number of cases. This was somewhat slower in appearing, in some cases not until after 48 hr., but was always very pronounced.

A cutaneous manifestation of vitamin A deficiency, G. P. GOODWIN (*Brit. Med. Jour.*, No. 3837 (1934), pp. 113, 114).—Following a brief review of literature describing peculiar skin symptoms recently observed in certain cases of vitamin A deficiency in China, Ceylon, and Uganda and similar symptoms observed more than 20 yr. ago among a few pellagra patients in Nyasaland, the author presents in considerable detail the report of a similar case, the patient being a 10-year-old boy whose diet had been conspicuously low in vitamin A.

The symptoms were described as a dry, harsh "goose-skin" with a papular eruption most marked on the extensor surfaces. "Other areas affected were the extensor aspect of the elbows, both shoulder regions, the buttocks and sacral region, and a small patch in the right preauricular region. There were numerous horny-feeling comedones on each knee; the nails of hands and feet looked drier than normal; the hair and scalp appeared normal. A small area of moist eczema was present at the left angle of the mouth. The eyes showed no xerosis, but there was injection of the vessels of the conjunctiva running from the inner and outer canthi of the eye to the cornea. A distinct yellowing of the scleral conjunctiva was also present. Examination for evidence of night-blindness proved negative. There was no hoarseness; the tongue was red and smooth, being denuded of its superficial papillae, while the gums of the upper jaw were swollen, retracted over the carious upper incisors, and presented the appearance of pyorrhea." Marked improvement, with almost complete recovery within 6 weeks, resulted from dietary treatment alone (including cod-liver oil).

A note from H. M. M. Mackay confirms the author's diagnosis and states that several children have been found in the out-patient department of the Queen's Hospital for Children, London, with a slight grade of an apparently similar condition of the skin.

Vitamin A deficiency, E. J. WRIGHT (*Brit. Med. Jour.*, No. 3839 (1934), p. 234).—In this letter, occasioned by the paper noted above, the author states that a similar condition was recognized by him as early as 1927 and described in west African medical literature under the name A and B avitaminosis disease of Sierra Leone. The condition is said to be increasingly recognized in the Tropics and to occur most frequently in school children and pregnant women. Failure or dimness of vision is considered one of the most baffling symptoms of this disorder.

Other factors than vitamins B and G in the vitamin B complex, R. C. LEWIS (*Jour. Nutrition*, 6 (1933), No. 6, pp. 559-570).—A critical review of the literature, with a bibliography of 53 titles.

Growth of rats fed high protein rations supplemented by different amounts and combinations of vitamins B (B_1), G (B_2), and B complex, L. D. FRANCIS, A. H. SMITH, and L. B. MENDEL (*Jour. Nutrition*, 6 (1933), No. 6, pp. 493-505).—Data collected in an earlier investigation, in which rats were subjected to unilateral nephrectomy and fed diets of varying protein content (*E. S. R.*, 65, p. 794), have been studied with respect to the effect upon growth of different quantities of vitamins B and G and the B complex when fed as supplements to diets containing 18, 50, and 90 percent of casein.

The animals receiving 50 percent casein grew as well as those receiving 18 percent and better than those receiving 90 percent. When yeast was used alone as a supplement to the diet furnishing 18 percent protein, 0.8 g daily gave better results than the other two levels tested, 0.4 and 1.6 g. On the diets containing the larger amounts of protein, any one of these levels of yeast

served as well as the other. With yeast and tikitiki extract the best growth was secured at a yeast level of 1.6 g. On diets containing 90 percent protein, the best growth was secured when yeast at the 1.6-g level was supplemented with either tikitiki or autoclaved yeast.

The authors conclude that, "in the absence of yeast, both an excess of B with a minimum of G, or an excess of G along with a small amount of B are unsatisfactory growth stimulants. Probably autoclaved yeast and tikitiki extract furnish only some of the necessary B vitamins."

The influence of the amount and composition of the diet on the course of vitamin B₁ deficiency [trans. title], H. G. K. WESTENBRINK (*Arch. Néerland. Physiol. Homme et Anim.*, 19 (1934), No. 1, pp. 94-115).—Following an extensive and critical review of the literature on the subject from 1912 to 1932, inclusive, a series of experiments is reported in which comparable groups of 20 pigeons each were fed the same quantities daily of vitamin B₁-free diets differing only in the principal source of energy, which was cane sugar for one group and peanut oil for the other.

The average number of days before the first symptoms of polyneuritis appeared was 19 ± 4 for the sugar diet and 27 ± 7 for the peanut oil diet. To make certain that no vitamin B₁ was being furnished by the peanut oil, a third group of 10 pigeons was given the peanut oil diet with the oil purified by boiling with alcoholic potassium hydroxide. The average time before the onset of polyneuritis in this group was 26 ± 3 days.

These findings are thought to support the conclusion of Lecoq (E. S. R., 69, p. 760) and others that the need for vitamin B is less on a high-fat than a high-carbohydrate diet. Three possible explanations are suggested: (1) That fat has a sparing action on vitamin B₁ as suggested by Evans and Lepkovsky, (2) that in each case vitamin B₁ is used at the same rate but that the presence of large amounts of fat in some way delays the onset of polyneuritis, and (3) that the excess carbohydrate produces toxic metabolic products which in the absence of vitamin B₁ are not removed and result in polyneuritis.

The loss of vitamin B₁ from certain organs of pigeons on a vitamin B₁-free, carbohydrate-rich, fat-deficient diet and on a vitamin B₁-free, carbohydrate-free, fat-rich diet, together with a comparison of the vitamin B₁ content of organs of rats and pigeons [trans. title], H. G. K. WESTENBRINK (*Arch. Néerland. Physiol. Homme et Anim.*, 19 (1934), No. 1, pp. 116-121, figs. 3).—The first of the three hypotheses suggested in the paper noted above was investigated by feeding rats, as supplements to a vitamin B₁-deficient diet, the dried powdered organs (liver, heart, brain, and muscle) of pigeons which had subsisted for 13 days on the two vitamin B₁-deficient diets of the previous study. No difference could be detected in the two series, the vitamin B₁ in both cases being practically exhausted at the end of 13 days. This is thought to disprove the theory that there is a difference in the rate of exhaustion of vitamin B₁ reserves on diets rich in carbohydrate and fat, respectively.

On the glycogen content in the liver of pigeons and rats by B₁-avitaminosis, H. ARIYAMA (*Bul. Agr. Chem. Soc. Japan*, 10 (1934), No. 1-3, pp. 47-55).—Studies are reported on the glycogen content of the livers of pigeons and rats on various vitamin B₁-free diets as well as complete diets.

In the case of pigeons, those which developed the disease without losing much body weight stored more glycogen than those on a normal diet, while those suffering from inanition as well as vitamin B₁ deficiency had less glycogen than the controls. Underfed pigeons also had less glycogen, but in pigeons

cured by the administration of active oryzanin (a vitamin B₁ preparation), the content of glycogen was more normal.

In rats fed carbohydrate-rich synthetic (vitamin B₁-free) diets, the glycogen was without exception 1.5 times higher than normal. In the animals cured by active oryzanin, the glycogen content was reduced to the normal level. In rats developing the typical symptoms of avitaminosis on a carbohydrate-free, high-fat, vitamin B₁-free diet, there was no increase of glycogen.

The author concludes that the abnormal increase of glycogen in the liver of rats fed a vitamin B₁-free diet is a secondary phenomenon of the disease. Inasmuch as the diets contained vitamin B₂ in the form of autoclaved yeast, it is concluded that it is vitamin B₁ which plays an important role in the metabolism of liver glycogen.

Vitamin C in the hypophysis [trans. title], A. GIROUD and C. P. LEBLOND (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 22, pp. 629-631).—This paper describes briefly the distribution of vitamin C in the hypophysis (ox) as determined by macroscopic and microscopic examination of sections stained with silver nitrate acidified with acetic acid. The most significant finding was the location of the greatest reducing activity in the chromophilic cells.

The origin of vitamin C in the mouse [trans. title], E. HARDE and J. WOLFF (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 19, pp. 288-290).—Titration with 2,6-dichlorophenolindophenol of extracts of various parts of the gastro-intestinal tract of numerous mice gave the following relative values: Liver 0.13-0.2, stomach 0.02-0.05, small intestine 0.18-0.37, and cecum and ascending colon 0.05-2.12 mg per gram. The same relative values were obtained with the authors' modification of the silver method, namely, absence or only traces in the stomach, higher figures for the small intestine than the liver, and variable quantities in the cecum and ascending colon.

In the guinea pig on diets containing vitamin C, the results were negative or only slightly positive in the stomach and in the cecum and ascending colon. A considerable amount of the reducing factor could be demonstrated in the small intestine and much more in the liver. In guinea pigs subsisting for 8 or 10 days on the vitamin C-deficient diet of the mouse, the gastro-intestinal tract did not reduce silver nitrate even after an hour of contact, but the liver showed a strong reaction within 15 min.

Although the reducing action may not be due entirely to vitamin C, the differences between the results obtained with the guinea pig and the mouse are thought to be of sufficient magnitude to point to a fundamental difference in the elaboration of reducing substances in the intestines of the two species.

The effect on the vitamin-C content of apples of storage in the frozen state in the presence and absence of molecular oxygen, S. S. ZILVA, F. KIDD, and C. WEST ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt.*, 1933, p. 80).—In this progress report (E. S. R., 71, p. 730), it is noted that Bramley Seedling apples, known to be rich in vitamin C, were found to lose practically all of their activity after 3 months' storage in air at -5° C. and about 70 percent for the same length of time at -10°. The destruction was even more marked after 6 months' storage under the same conditions, but apples of the same variety stored in a vacuum showed no appreciable loss of vitamin C at -20° and only about 25 percent loss at -10° and -5°.

Vitamin C in canned apples, S. S. ZILVA and T. N. MORRIS ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt.*, 1933, pp. 164, 165).—Apples of the Bramley Seedling variety were prepared as follows: Peeled and cored apples (a) and cored but not peeled apples (b) were steamed, after a very short im-

mersion in brine, on a covered hair-sieve over boiling water for 3 or 4 min. or until soft enough to give a solid pack. Lacquered No. 2½ cans were then filled to weight, hot water was added, and after a short exhaust the cans were sealed and processed for 25 min. in boiling water. Apple peelings (c) were also steamed until soft and canned in the same way.

Prophylactic guinea pig tests of the various products for vitamin C content showed that "(a) was only about a third as active as raw Bramley's Seedling apples (1-2 international units per gram, calculated on a raw-apple basis, as compared with 3-5 for raw apple); that (b) was more active and contained about as much vitamin C as the unpeeled raw apple (3-5 international units per gram, calculated on a raw-apple basis); and that (c) was almost as active as the raw peel (about 15 international units per gram, calculated on a raw basis). The interesting point was that the removal of the peel before steaming was responsible for a great loss of the vitamin during canning."

The experiments were then repeated simultaneously with those of Kohman et al. (E. S. R., 53, p. 566) in which the apples were soaked in brine for from 18 to 24 hr. before canning. The results confirm not only the preliminary studies in showing the preservation of vitamin C by process (b), but also the earlier findings of Kohman et al. "The striking fact was that, making allowances for the presence of the peel, the vitamin was as well preserved in (b) as in the apples prepared by Kohman's process, which, as mentioned above, entails little loss of vitamin C."

The urinary excretion of vitamin C [trans. title], P. ROHMER, N. BEZSSON-OFF, R. SACREZ, and E. STOERR (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 27, pp. 1414-1416, fig. 1).—As evidence that young infants have the power of synthesizing vitamin C, data are presented on the bromine-fixing power of the urine of infants of varying ages from 2 to 23 mo. normally fed and deprived of vitamin C. The values corresponded closely up to 14 mo. and then became much higher for those deprived of vitamin C.

Outline of a method for the determination of the strength of the skin capillaries and the indirect estimation of the individual vitamin C standard, G. F. GÖTHLIN (*Jour. Lab. and Clin. Med.*, 18 (1933), No. 5, pp. 484-490, fig. 1).—A description, with illustration, is given of the apparatus employed by the author in determining capillary resistance as a means of detecting mild deficiencies in vitamin C, the technic employed is described in detail with interpretation of the readings, and points to be observed in conducting the test on a large scale, as in schools, are discussed.

The probable presence of ascorbic acid in the vitreous humor of ox eye [trans. title], C. DUMAZERT and P. PASSELAIGUE (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 25, pp. 1035, 1036).—Attempts to isolate ascorbic acid from the vitreous humor of ox eyes resulted in the separation of an osazone soluble in sodium carbonate and giving a red coloration with sulfuric acid. Further identification of this acid aldehyde with ascorbic acid was impossible on account of lack of material. Determinations of ascorbic acid by the use of Tillman's reagent according to the technic of Birch, Harris, and Ray, and of ascorbic acid plus glutathione by iodometric titration, on five samples of vitreous humor gave values for glutathione ranging from 2.3 to 8 mg per 100 cc and for ascorbic acid of from 10 to 14.3 mg per 100 cc.

Previous identification by others of ascorbic acid in the aqueous humor and crystalline lens, together with the present proof of its existence in the vitreous humor, lead the authors to suggest that its presence in the eye is a physiological necessity, possibly for the metabolism of the retina.

Ascorbic acid, experimental scurvy, and the Bezssonoff reaction [trans. title], G. MOURIQUAND, L. WEILL, and F. SIMON (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 21, pp. 543, 544).—Tests with the Bezssonoff reagent of the urine of guinea pigs on a scorbutic ration unsupplemented and supplemented with lemon juice and with ascorbic acid gave results paralleling the clinical findings. The animals receiving either supplement were completely protected from scurvy, and their urine gave a violet coloration with the Bezssonoff reagent.

Diet and reproduction.—IV, The bipartite nature of vitamin-E, G. GRIJNS and E. DINGEMANSE (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 36 (1933), No. 3, pp. 242-248).—The methyl alcohol extract of wheat germ prepared according to the Evans method for concentrating vitamin E has been separated into two fractions, one of which promotes fertility in the male and the other in the female rat. The method of separation is described, and data are reported showing the fertility of males and females on the two fractions as sources of vitamin E and also on a fraction prepared according to a patented method for the extraction of the female hormone from wheat. This fraction proved to contain a fertilizing factor for males but not for females.

Solar ultraviolet radiometry, I—IV, W. D. FLEMING (*Philippine Jour. Sci.*, 50 (1933), Nos. 2, pp. 185-188; 3, pp. 279-299, pl. 1, figs. 5; 51 (1933), No. 1, pp. 69-86; 53 (1934), No. 3, pp. 339-378).—This investigation is reported in four papers as follows:

I. *The ultraviolet limit of sunlight*.—To determine whether or not the limit of short wave lengths of sunlight, generally taken as about 290 $m\mu$, is extended in the Tropics, solar spectrophotographs were made with a refined technic at Baguio, P. I., at an elevation of 4,800 ft. and at Manila from an airplane at an altitude of 10,000 ft. The shortest wave length that could be seen with certainty was 293 $m\mu$ at both levels.

II. *Instruments and methods*.—This paper describes the apparatus used and methods developed for the determination of the energy present in the ultraviolet region of sunlight in terms of absolute units (watts per square millimeter) for four spectral bands—290-310 $m\mu$, 310-370 $m\mu$, 370-400 $m\mu$, and 400-460 $m\mu$, as well as the total energy in the sunlight between the limits of 290 and 1,400 $m\mu$. Certain limitations in the method are discussed, particularly the errors involved if the sun is clouded over even slightly. For this reason determinations are made only with a cloudless sun.

III. *Comparative values for Manila and Baguio, Philippine Islands*.—Following the methods described in the previous paper, solar energy values were obtained in the four spectral regions selected at Manila (sea level) and Baguio (4,800 ft. elevation). The observations at Manila were made from October 31 to December 23, 1931, with the majority of them in December, and at Baguio in January 1932. The means of the values obtained throughout the periods are tabulated according to air mass as morning sun values, afternoon sun values, and values for the day as a whole. The relative values for the two places are

B
given as — ratios.

M

The light in the visible region was about equal in energy for the two places, but in the three spectral regions in the ultraviolet the amount of energy was much greater in Baguio than in Manila. There were greater variations in the amount of sunlight in Manila than in Baguio. There was some evidence that afternoon sunlight in Manila produced erythema to a less degree than morning sunlight. Dust raised by city traffic is suggested as a possible explanation of this.

IV. *The ultraviolet of sunlight in Manila.*—Data obtained by the same methods as in the previous studies are reported for Manila for a period of 1 yr. from February 1932 to January 1933, inclusive. Observations were made both morning and afternoon on every day when the condition of clear sun entirely free from clouds lasted for from 7 to 15 min. In all there were 65 morning and 39 afternoon observations.

The most striking feature of the data is thought to be the absence of a marked peak of values such as has been found for June and adjacent months in other places. Several factors contributing to this are discussed.

A comparison of the data with observations reported in the literature for New Orleans and Washington, D. C., indicate that for equal air mass the solar ultraviolet energy in Manila is nearly the same at a given hour (10 a. m.) as in New Orleans but notably less than in Washington. The greater solar energy in Manila in the winter months at this time of day is attributed to the much lower air mass than in the other places. "The antirachitic efficiency of Manila sun is such that 15 minutes' daily exposure of the entire skin surface to sunlight in October at 3:30 p. m. or 2 minutes' similar exposure at noon throughout the year should protect against rickets."

[Food allergy] (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 17, pp. 1275-1285, 1290-1293, figs. 7).—The question of food allergy receives considerable attention in the papers noted below, which were presented and discussed at the 1934 meeting of the American Medical Association: Specific Diagnosis and Treatment of Allergic Diseases of the Skin: Present Status, by A. F. Coca (pp. 1275-1277); Acneform Eruptions of the Face: Etiologic Importance of Specific Foods, by C. White (pp. 1277-1279); Light Sensitive Dermatoses, by N. P. Anderson and S. Ayres, Jr. (pp. 1279-1285); and Abstract of Discussion (pp. 1290-1293).

On the alleged toxicity of cod liver oil, W. M. Cox, Jr., and A. J. Roos (*Bul. Johns Hopkins Hosp.*, 54 (1934), No. 6, pp. 430-439, fig. 1).—The conflicting literature on the subject is reviewed briefly, with tabulated data summarizing the principal findings, and experiments are reported in which rats were fed cod-liver oil to the extent of 78 percent of the total calories, with control animals receiving the same amount of fat in the form of lard and with 1 percent of cod-liver oil to furnish vitamins A and D. The feeding was begun at weaning and continued for 130 days.

The rate of growth of the rats receiving cod-liver oil was definitely subnormal and much below that of the rats in the control group, but there was no histological evidence of pathological lesions in the heart, as had previously been noted by E. Agduhr.

It is emphasized in the discussion that the present paper does not detract from the position that cod-liver oil cannot be fed at high levels without deleterious effects, but that no obvious explanation for this has been found as yet.

TEXTILES AND CLOTHING

Tests to determine the durability and extent to which raincoat fabrics are waterproof, R. JOHNSON and K. CRANOR (*Textile Colorist*, 56 (1934), No. 663, pp. 191, 192, figs. 3).—Popular raincoat fabrics of the current season, comprising 11 groups totaling 45 fabrics, were tested at the Iowa State College, for tensile strength, elasticity, resistance to water, edge-cracking, and fading.

The breaking strengths of all the fabrics tested, except silk, in the warp, were above the specifications of the Proofers' Division of the Rubber Association of America. Four groups—double-texture jersey, jersey with flannel back,

oiled silk, and the lightweight fabrics of single texture—did not meet the requirement in the filling. Double-texture fabrics (except the tweeds), leatherette, police cloth, and imitation suede were high in breaking strength, while oiled silk was lowest in this respect. Double-texture jersey had greater elasticity than the other fabrics, and trench cloth had the least.

The heavy-napped fabrics and police cloth ranked highest in resistance to water, jersey with flannel back and imitation suede second, and the double jersey, leatherette, and trench cloth ranked third. Lightweight single-texture fabrics and double-texture crepe were low in resistance, and tweeds and oiled silk were not resistant to water.

The bright-colored fabrics in all groups lost the most color in exposure tests, whereas the neutral-colored fabrics faded the least. The fading in all cases, with the exception of oiled silk, was very gradual.

All of the fabrics were resistant to the edge-cracking test except surface-finished fabrics in the lightweight group. The base fabric in the lightweight group of single-texture fabrics was destroyed after long exposure to weather. Tweeds and crepe fabrics stiffened more than any of the other groups. Trench cloth, heavy-napped fabrics, and leatherette usually showed no visible deterioration from exposure. The lightweight fabrics of single texture gave the lowest results in all tests, indicating that they were the least durable.

HOME MANAGEMENT AND EQUIPMENT

A survey of the cooking practices in Maine rural and village households. M. M. MONROE (*Maine Sta. Bul.* 372 (1934), pp. 89-107, fig. 1).—In the survey reported, 299 members of women's clubs and 634 members of farm bureaus answered questionnaires on size of household; fuels used for cooking, for heating the kitchen, and for heating water in both summer and winter; and lists of food served for three meals during a typical day, together with the method of cooking them. There were also secured 23 weekly records from club members and 103 from farm bureau members of all cooking done, with the foods used, methods of preparation, utensils, and length of cooking period.

The data obtained are tabulated and discussed, and general suggestions are given as to the solution of problems arising when changing from wood or coal to electricity as a source of heat for cooking. These are summarized as follows:

"In order for the Maine housewife to be able to use the electric range at reasonable cost, she should secure other means of heating large quantities of water; make a greater attempt to use the oven more economically than she has been by baking more than one food at a time, and by using the oven for only those processes which cannot be satisfactorily cooked on the surface, or by using a small, low thermal capacity oven for short-time processes (if they occur sufficiently often to permit a saving in cost of operation which would make the purchasing on an extra oven a sound investment); utilize the heat stored in the oven and in the surface units by following one group of finished processes immediately with another group while the oven or the surface unit is hot; and time her cooking processes so that foods will not be cooked longer than necessary."

Attention is called to Bulletin 371 (E. S. R., 72, p. 139) as offering practical suggestions concerning efficient practices in the use of electricity for cooking.

Time and cost evaluation of dishwashing by different methods. V. E. SATER (*Washington Sta. Bul.* 303 (1934), pp. 19, figs. 3).—This study consists of the comparison of the time required in washing dishes for serving a selected

breakfast, lunch, and dinner for a family of five, using a hand method, a sink spray method, and an electric dishwasher method. The processes found from preliminary tests to be most desirable for each of these methods are described in detail, and data are reported for each on the time consumed, cost of equipment, and operating cost.

The sink-spray method did not prove satisfactory. With the electric dishwasher the time saved over that required for hand washing amounted to 18.23 min. per day, or 9.13 hr. per month. The total cost of owning and operating the dishwasher was calculated to amount to \$2.95 per month as compared with a total cost of 45 ct. for the hand-washing method.

The report includes a discussion, with references to the literature, of dishwashing problems from the standpoint of sanitation and energy, as well as time and cost. A list of 20 references to the literature is appended.

Investigation of warm air furnaces and heating systems, VI, A. P. KRATZ and S. KONZO (*Ill. Engin. Expt. Sta. Bul. 266 (1934), pp. 128, figs. 50*).—This is the ninth progress report of these investigations and relates to the sixth feature of the work (*E. S. R.*, 68, p. 570).

In a preliminary study of forced air heating systems it was found that the installation of dampers is necessary in order to obtain proper heat supply and temperature balance in the rooms. The use of branch ducts as small as 3 by 10 in. in connection with much larger ducts is not to be recommended on account of the excessive drop in temperature of the air flowing in such ducts. A high bonnet and large ducts at the bonnet act as a plenum chamber and serve to equalize the temperature of the air at the outlets from the bonnet. A certain amount of gravity action takes place in a forced air system during the off-period of the fan. Most of this action occurs in ducts leading to second and third stories and complicates the problem of control for such systems.

Studies of the performance characteristics of forced air heating systems showed that considerably higher capacity and furnace efficiency for given combustion rates may be obtained with a forced air system than with a gravity plant. The high furnace efficiency in a forced air system as compared with that for a gravity plant is not reflected as an increase in over-all house efficiency or as a saving in fuel required to heat the house. The fuel consumption is practically independent of the volume of air circulated and of the type of control used in these tests. With continuous fan operation temperatures 1° to 2° F. higher near the floor and lower near the ceiling are obtained than the corresponding temperatures for a gravity plant. With intermittent fan operation no marked improvement of the temperature near the floor occurs, but temperatures near the ceiling are approximately 1° lower than those for the gravity plant.

Studies of pressure losses in forced air heating systems showed that static pressures measured in various parts of a forced air system are meaningless unless interpreted in the light of changes in air velocity as well as of friction and shock losses. Owing to the presence of shock losses, the magnitudes of which are largely uncertain, complete and exact advance estimation of the pressure losses in a forced air system is practically impossible, and the actual pressures under which the plant operates may differ considerably from the predicted or estimated pressures on which the design of the plant was based, without impairing the usefulness of the plant or preventing satisfactory adjustment and operation. In the design of a forced air heating system a generous allowance should be made for the effect of dampers, particularly on the warm-air side. Such dampers may have to be set to offer a very high

resistance in some of the worst or longest runs to take care of an unforeseen condition introduced by a poor branch.

Tests of pressure losses through air filters in the forced air systems showed that the resistance of filters depends on the type of filter and on the closeness of the weave or the compactness of the material used in their construction. The total resistance in the system depends on the type of filter, the method of installation, and the quantity of air passed per filter. The resistance of a filter increases progressively but not uniformly with the time of service.

Tests of automatic control systems for forced air heating systems showed that the room air temperature may best be maintained within definite limits by operating the fan from the room thermostat (through a fan relay). For ideal operation the operating range of bonnet air temperatures should be varied either manually or automatically to correspond to the heating demands of the house. The most satisfactory operation of the heating plant required the maintenance of a uniform combustion rate just sufficient to supply the heating demands made on the furnace. This requirement involves frequent openings and closings of the furnace damper and can best be fulfilled when the damper operation is dependent on both the room temperature and the bonnet air temperature. This is equally true for both gravity and forced air systems.

In systems using intermittent fan operation uniformity in the length of the on- and off-periods of the fan is necessary in order to maintain equal temperatures in the different rooms. With control systems involving intermittent operation of the fan it should be started between four and eight times per hour in order to obtain satisfactory regulation and equal temperatures in the different rooms. Continuous operation of the fan is advantageous in that it results in high bonnet efficiency, minimum air stratification, and low heat losses from the ducts. The total power required for intermittent fan operation varies from 10 to 100 percent of that required for continuous fan operation. In the case of intermittent operation the power required to start the fan contributes an additional load varying from 3 to 27 percent in excess of the normal running load over a range of indoor-outdoor temperature differences of from 20° to 60°. The fuel consumption and over-all house efficiency are practically the same for intermittent fan operation and for continuous fan operation. A stack limit thermostat arranged to prevent flue gas temperatures from exceeding a predetermined upper limit can be successfully used to limit the combustion rate during periods of sudden load demand.

Tests of furnace bonnets and baffling showed that cylindrical bonnets with straight vertical sides and flat top and bonnets shaped like a truncated cone are equally effective and are better than straight-sided flat-top bonnets which are only 7.75 in. above the radiator. The use of an annular baffle in the casing has no detrimental effect at combustion rates below 2.5 lb. per square foot per hour, and improves the capacity and efficiency at combustion rates above 2.5 lb. per square foot per hour.

Studies of warm-air registers located near the ceiling and near the floor showed that high side-wall registers with the common type of grills when operated with low air velocities comparable with those practical for base-board registers cause excessive stratification of the air in the room, resulting in high air temperatures in the part of the room above the 5-ft. level. High side-wall registers with the common type of grills should not be used with the average velocity of the air at the register face less than 500 ft. per minute. Deflectors or louvers at the register face of high side-wall registers, set to direct the air at an angle of 45° downward, overcome stratification of the air

in the room but may produce objectionable air currents in front of the register. The use of vertical diffusers in addition to the horizontal louvers in connection with high side-wall registers is of no material advantage. Intermittent fan operation in connection with high side-wall registers results in greater stratification of the air in the room than that occurring with continuous fan operation. Intermittent fan operation in connection with baseboard registers equipped with louvers set at 15° downward does not result in greater stratification of the air in the room than that occurring with continuous fan operation.

Baseboard registers with the common type of grills should not be operated with air velocities at the register face greater than 300 ft. per minute. Baseboard registers with louvers at the face set downward at an angle of 15° with the horizontal effectively eliminate air stratification in the room and permit the use of air velocities at the register face as high as 500 ft. per minute without the air currents becoming objectionable. With a baseboard register the addition of diffusers to deflect the air outward 15° from a central vertical plane and downward 15° below the horizontal does not materially reduce the air temperature near the ceiling or increase it near the floor, but it does permit the use of air velocities at the register face as high as 800 ft. per minute without the air currents becoming objectionable.

Studies also are reported of the performance of two types of air washers and of heat emission from various surfaces. In the latter studies it was found that in the case of uninsulated metal surfaces transmitting heat to air the nature of the metal and thickness of the wall may bear little or no relation to the heat transferred. The character of the surface finish is a major factor in determining the heat transferred, bright metal surfaces transmitting less heat than rusty metal or painted surfaces. Thin layers of insulation placed on bright metal surfaces transmitting heat to air may result in increasing the heat transferred. Such surfaces should be covered with the equivalent of at least 0.25 in. of good insulation. Crimped asbestos paper has the same characteristics as plain asbestos paper when used as a heat insulator.

Rural housing survey, A. P. BROWN (*Utah Sta. Bul.* 250 (1934), p. 52).—A brief summary is given of the essential data obtained in the Utah rural housing survey conducted as part of the Nation-wide Federal Civil Works Administration Project noted below.

Farmhouse plans, W. ASHBY (*U. S. Dept. Agr., Farmers' Bul.* 1738 (1934), pp. II+70, figs. 40).—The plans here presented for low-cost farm dwellings were developed in connection with the Farm Housing Survey made in the spring of 1934 by the Department and the agricultural colleges of 46 States with funds provided by the Civil Works Administration.

The evolving house.—I, A history of the home, A. F. BEMIS and J. BURCHARD 2nd (*Cambridge: Mass. Inst. Technol.*, 1933, pp. XXXI+502, figs. 152).—This is the first of a series of three volumes dealing with the fundamental features of housing. It presents the history of the home to provide a background to housing development. It includes three parts relating to prehistoric and primitive homes, evolution of the modern American home, and modern homes of the world.

Michigan farm homes, C. H. JEFFERSON (*Michigan Sta. Spec. Bul.* 251 (1934), pp. 43, figs. 49).—The purpose of this bulletin is to present a number of carefully prepared farmhouse plans, together with a brief discussion of some of the most important building problems so that many of the frequent mistakes may be avoided by the prospective builder. Information on home furnishings by F. Gilmore and on landscaping the farm home by O. I. Gregg is also included.

MISCELLANEOUS

New Federal organizations: An outline of their structure and functions, L. F. SCHMECKEBIER (*Washington, D. C.: Brookings Inst., 1934, pp. IX+199*).—The organizations described in this volume are those established between March 4, 1933, and July 1, 1934, as well as the Reconstruction Finance Corporation and the Federal Home Loan Bank Board. A brief account is given of the purpose of these organizations, the authority for their creation, the extent of their field organization, and a brief statistical measure of their activities. Among those of direct interest to agriculture which are considered are the Farm Credit Administration (pp. 24-36), the Agricultural Adjustment Administration (pp. 83-93), the Federal Emergency Conservation Work (pp. 104-108), the Federal Emergency Relief Administration (pp. 108-121), the Soil Erosion Service (pp. 135-137), the Subsistence Homesteads Division (pp. 137-142), the National Resources Board (pp. 160, 161), the Science Advisory Board (pp. 165-167), and the Tennessee Valley Authority (pp. 177-186).

Fifty-seventh Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1933, W. L. SLATE ET AL. (*Connecticut [New Haven] Sta. Rpt. 1933, pp. [943], figs. 190*).—In addition to the usual administrative data, this report contains reprints of Bulletins 355-364, previously noted, and of the following circulars: Nos. 94, Testing Vegetables for Connecticut: Results for 1933, by L. C. Curtis (pp. 1-16); 95, the Interpretation of Soil Tests, by M. F. Morgan (pp. 17-24); 96, Stewart's Bacterial Wilt on Sweet Corn, by G. P. Clinton and W. R. Singleton (pp. 25-36); 97, Fleas and Their Control, by B. H. Walden (pp. 37-42); 98, Late Blight of Tomatoes, by A. A. Dunlap (pp. 43-46); 99, Control of the Plum Curculio on Fruit Trees, by P. Garman (pp. 47-53); 100, Substitutes for Lead Arsenate on Fruits and Vegetables in Connecticut, by P. Garman and N. Turner (pp. 55-58); 101, Control of Apple Maggot, by P. Garman (pp. 59-63); 102, Potato Spraying, by A. A. Dunlap (pp. 65-72); 103, Law and Regulations concerning the Inspection and Shipment of Nursery Stock in Connecticut (pp. 73-77), and 104, Quarantine Measures Restricting Shipments of Connecticut Plants, 1934 (pp. 79-82), both by W. E. Britton; and 105, Regulations concerning Transportation of Nursery Stock in the United States and Canada, compiled by W. E. Britton (pp. 83-108).

Annual Report [of Florida Station], 1933, W. NEWELL ET AL. (*Florida Sta. Rpt. 1933, pp. 211+VII, figs. 11*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological observations in the Everglades are also included (pp. 158-161).

Report of the Hawaii Agricultural Experiment Station, 1933, J. M. WESTGATE ET AL. (*Hawaii Sta. Rpt. 1933, pp. [2]+27, figs. 7*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Summary report of progress [of Utah Station], July 1, 1932, to June 30, 1934, P. V. CARDON (*Utah Sta. Bul. 250 (1934), pp. 66*).—The experimental work reported is for the most part noted elsewhere in this issue.

Farm Research, October 1, 1934 (*Farm Res. [New York State Sta.], 1 (1934), No. 1, pp. 8, figs. 5*).—In addition to several articles noted elsewhere in this issue, this number contains Straining Milk an Involved Operation, by A. C. Dahlberg (p. 3), and Farming along the Mediterranean Sea, by R. S. Breed (p. 7).

Numerical list of available publications (January 1931) (*Vermont Sta. Circ. 15 (1931), pp. 7*).

NOTES

California University and Station.—Thomas F. Tavernetti, assistant dean of the College of Agriculture, died December 23, 1934, at the age of 45 yr. A native of California and a graduate of the university, he had been associated with its work continuously since graduation in 1913, mainly along administrative lines but also for several years as assistant professor of farm practice.

Paul F. Nichols, associate in fruit products, died November 4, 1934. He was born in Everett, Mass., November 26, 1893, graduated from Bates College in 1916, had studied in the Massachusetts Institute of Technology, and received the M. S. degree from the University of California in 1928. He was connected with the fruit and vegetable dehydration studies of the U. S. Department of Agriculture on the Pacific coast from 1918 to 1924, with grade standardization investigations for the Sun Maid Raisin Association at Fresno from 1924 to 1926, and subsequently had been in charge of the station's investigations in fruit drying and dried fruit packaging.

Dr. E. A. Stokdyk, associate professor of agricultural economics and associate agricultural economist, has resigned to continue work with the Federal Farm Credit Administration, with which he had been working on leave of absence since October 1933.

Idaho University and Station.—Much the largest enrollment for both the College of Agriculture (203) and the entire university (2,200) in the history of the institution is recorded. The entering class increased from 537 in 1933 to 854.

Dr. Leif Verner, assistant professor of horticulture from 1927 to 1930 and subsequently assistant horticulturist in the West Virginia Station, has been appointed head of the department of horticulture vice the late Dr. C. C. Vincent. Henry C. Hansen, instructor in dairy husbandry, has been given a year's leave of absence for graduate study at the Iowa College, and Harold A. Vogel, assistant agricultural economist, 6 months' leave to serve as State land planning consultant with the National Resources Board.

Iowa College.—Helen A. Bishop, connected with the home economics department since 1927 and since 1929 head of the department of home management, died November 4, 1934, at the age of 47 yr. She was a graduate of James Millikin University and had also taught in the schools of St. Louis and Oklahoma City, the National School of Domestic Art and Science, and from 1922 to 1927 in the Kansas College.

Kansas College and Station.—J. B. Fitch, head of the department of dairy husbandry, resigned December 31, 1934, to become chief of the division of dairy husbandry in the Minnesota University and Station. I. K. Landon, assistant professor of agronomy and in charge of the Southeast Kansas Experiment Fields, who has been on leave of absence for the past year as agronomist in the soil erosion service at La Crosse, Wis., has resigned, effective January 31, 1935. T. R. Reitz, assistant professor of horticulture and in charge of the Northeast Kansas Experiment Fields, has been granted leave of absence to June 30, 1935, to serve as unit director of the Plains shelter belt project of the U. S. D. A. Forest Service, with headquarters at Manhattan. F. L. Timmons, assistant professor of farm crops and assistant in cooperative experiments, has been transferred to the extension division for the remainder of the present fiscal year to serve as specialist in farm crops during the absence of E. B. Wells, who is working with the Federal Seed Stocks Committee in Kansas.

City. Roy M. Green, professor of agricultural economics and on leave to serve as vice president of the Production Credit Corporation of Wichita, has been appointed principal agricultural economist in the division of cooperative marketing, U. S. Farm Credit Administration.

Kentucky University and Station.—Dr. Daniel J. Healy, bacteriologist in the station department of animal pathology, died November 24, 1934. He was born in Toronto, Canada, March 26, 1873, and graduated from McGill University in 1896. He had been associated with the station since 1910, and for most of the period with the university as professor of agricultural bacteriology.

W. C. Eskew, field agent in cream grading, has resigned.

Louisiana Station.—J. Fielding Reed has been appointed assistant chemist for research in soils, and Harry H. Laidlaw, Jr., assistant in agricultural economics.

Massachusetts College.—Claude R. Kellogg, assistant professor of entomology, has resigned to return to China, where he will resume the position held from 1916 to 1931 as professor of entomology and beekeeping in the Fukien Christian University.

Nevada Station.—On the night of November 10, 1934, fire destroyed most of the station dairy plant at Fallon, including the dairy barn, silo, granary, and hay barn, about 70 tons of hay, and some machinery and equipment. All buildings except the silo are being rebuilt, and all floors and mangers will be of concrete and the roofs of corrugated galvanized iron. The new dairy barn will be 150 ft. long.

Clemson College and South Carolina Station.—H. W. Barre, dean of the School of Agriculture and director of the station, has been granted leave of absence for 1 yr. to reorganize the work of the division of cotton and other fiber crops and diseases in the U. S. D. A. Bureau of Plant Industry. R. A. McGinty, formerly horticulturist and more recently horticulturist at the Oklahoma Station, has been appointed acting director of the station during the period of his absence.

The station dairy barn was burned February 6. The herd was saved.

Virginia Polytechnic Institute and Station.—E. L. Wood, assistant in entomology, resigned from the station November 15, 1934, to accept a corresponding position in the extension service, and has been succeeded by R. N. Jefferson.

The American Phytopathological Society.—The twenty-sixth annual meeting of this society was held, under the presidency of Dr. Neil E. Stevens, at Pittsburgh, Pa., December 27–29, 1934, in connection with the A. A. A. S. It was marked by a large attendance and a crowded and interesting program of more than 100 papers, which necessitated the holding of several sections at the same time. The contributions gave evidence of rapid progress in the fundamental study of plant diseases and control practices, and reflected broadening and more penetrating viewpoints in the application of science to the effective reduction of agricultural hazards due to crop maladies.

At least 10 serious diseases, but recently recognized in the United States, were discussed. Perhaps the most important of these is the spotted wilt, attacking a wide range of host plants, on which M. W. Gardner of the California Experiment Station reported. The long distance spread of living pathogenic spores in the upper air strata was brought out by the results of airplane sampling over the North Atlantic region by Col. Charles A. Lindbergh in 1933, as presented by F. C. Meier. In demonstrating that a species of flea beetle is a natural overwintering host of Stewart's bacterial sweet corn wilt, F. W. Poos and Charlotte Elliott of the U. S. Department of Agriculture threw important light upon the peculiar behavior of this wide-spread trouble. The

variability of pathogenic organisms, the influence of external factors on parasitism, and the effects of various micro-organisms upon each other were also emphasized by different speakers.

In the field of virus diseases encouraging progress was evident. L. O. Kunkel of the Rockefeller Institute, for instance, reported the complete elimination of the peach yellows virus from affected trees by growing them for 2 weeks at a greenhouse temperature ranging from 92° to 99° F. K. S. Chester of the same institution reported successful use of serological technic in revealing group relationships among plant viruses. W. D. Valleau of the Kentucky Experiment Station brought forward strong evidence against the view that tobacco ring spot infection is followed by recovery and acquired immunity.

New fungicidal materials and methods of soil and seed treatment were suggested that for certain purposes appear to have advantages over those in use today. G. W. Keitt of the Wisconsin Experiment Station, for example, presented evidence, based on extensive studies, that combinations of copper sulfate with various arsenites, when used as sprays, can prevent the development of the over-wintering stages of apple scab and other important plant pathogens. Cooperation was offered to any interested in testing such materials.

At the business session it was agreed to hold a special conference on plant quarantine problems at the next annual meeting and also to devote special consideration to the coordination of research and extension work. The society went on record as urging search for the Dutch elm disease in all parts of America where elms are of importance. It was recommended that Federal and State agencies consider the feasibility of eradicating the potato wart disease from the United States, instead of continuing quarantines or allowing the disease to spread. Progress was reported on the efforts being made by the society to establish relations with the International Union of Biological Sciences.

It was announced that a summer meeting would probably be held in connection with A. A. A. S. convention at Minneapolis the last week in June 1935. The next annual meeting is to be held at St. Louis, Mo., December 31, 1935, to January 2, 1936, in connection, as usual, with the A. A. A. S.

The following officers were chosen: President, H. T. Güssow, Central Experimental Farm, Ottawa; Vice President, F. C. Meier, U. S. D. A. Extension Service; Secretary, Howard P. Barss, U. S. D. A. Office of Experiment Stations; Treasurer, H. A. Edson, U. S. D. A. Bureau of Plant Industry; Councilor, J. C. Walker, Wisconsin Experiment Station; and Editor-in-Chief, H. B. Humphrey, U. S. D. A. Bureau of Plant Industry.

New Journals.—*Agricultural Sinica* is being published from time to time by the National Agricultural Research Bureau, Ministry of Industries, Nanking, China, as "a periodic record of investigations in Chinese agriculture." The initial number consists of a contribution in German and Chinese by P. H. Tsai, entitled *Experimental Observations on the Influence of Temperature and Atmospheric Moisture on the Egg Laying of *Ocalandra granaria**.

Claytonia is being published in mimeographed form bimonthly by the committee on State flora of the Virginia Academy of Science and with Ruskin S. Freer of Lynchburg College as editor. The initial number contains contributions from the Virginia Polytechnic Institute and the Virginia Truck Station. It is hoped to produce eventually a complete and authoritative flora of the State.

R

LI 3

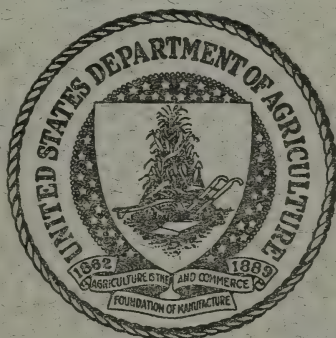
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 72

APRIL 1935

No. 4

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment—
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOL. 72, NO. 4

Editorial:	
Abram Winegardner Harris (1858-1935), second director of the Office of Experiment Stations.....	Page 433
Recent work in agricultural science.....	436
Agricultural and biological chemistry.....	436
Agricultural meteorology.....	446
Soils—fertilizers.....	448
Agricultural botany.....	456
Genetics.....	460
Field crops.....	466
Horticulture.....	476
Forestry.....	486
Diseases of plants.....	488
Economic zoology—entomology.....	500
Animal production.....	514
Dairy farming—dairying.....	522
Veterinary medicine.....	528
Agricultural engineering.....	539
Agricultural economics.....	547
Rural sociology.....	556
Agricultural and home economics education.....	558
Foods—human nutrition.....	559
Textiles and clothing.....	572
Home management and equipment.....	573
Miscellaneous.....	574
Notes.....	575

EXPERIMENT STATION RECORD

VOL. 72

APRIL 1935

No. 4

EDITORIAL

ABRAM WINEGARDNER HARRIS (1858-1935), SECOND DIRECTOR OF THE OFFICE OF EXPERIMENT STATIONS

The services rendered to the land-grant colleges by the late Dr. Abram Winegardner Harris, who died in Philadelphia February 21, 1935, at the age of 76 yr., began with his appointment in the Office of Experiment Stations in 1888 and ended with his resignation from the presidency of the University of Maine in 1901. His later career, covering a period of about 30 yr., was associated with other types of education, and his conspicuous success in these fields tended to overshadow in the public mind his earlier accomplishments for industrial education and agricultural research. Nevertheless, his contribution to their advancement throughout the formative period of the nineties was timely and substantial, meriting more than passing notice from the present generation.

The life of Dr. Harris well illustrates the fact that for certain types of leadership a sound fundamental training and an open mind frequently transcend in importance profound technical knowledge and extended specialization. He was the first assistant to be selected for the newly established Office of Experiment Stations, and like the director, Dr. W. O. Atwater, and his coworker and successor, Dr. A. C. True, whose appointment soon followed, he was a graduate of Wesleyan University. His boyhood was spent in Philadelphia, and the 8 yr. following his graduation were occupied with teaching mathematics and history. Yet although he came to the Office without previous contacts with agriculture, his appointment, like most of those of Dr. Atwater's selection, was fully justified by his adaptability and broad vision. As he himself stated in 1901, "when I came I had slight appreciation of the meaning or importance of the cause in which I had volunteered. I fear I held for technical training something of that foolish superiority which the man of classical training often expresses in the word 'utilitarian' . . . Nevertheless, I am a complete convert to the system represented here. Had I spent my undergraduate days in a land-grant college or State university, I could not believe more deeply in the oneness of truth, in the essential equality of its forms, whether literature, or philosophy, or science, or the arts of commerce, manufacture, agriculture, and in the efficiency of the State education."

Although the Office of Experiment Stations was established to represent the Secretary of Agriculture in his relations with the State experiment stations under the Hatch Act, its early authority was restricted to doing little more than "indicate from time to time such lines of inquiry as to him shall seem most important and in general to furnish such advice and assistance as will best promote the purposes of this act." The principal function open to the Office was, therefore, that of a clearing house of information, and its publications were its major activity. Dr. Harris participated in the planning of most of the early series, including *Experiment Station Record*, and he is specifically credited with the editing for the Office of the Proceedings of the Association of American Agricultural Colleges and Experiment Stations from 1889 to 1892, inclusive.

Upon the withdrawal of Dr. Atwater from the directorship of the Office in 1891, Dr. Harris, who had been serving as assistant director, assumed full charge at the early age of 32 yr. He continued in this capacity for about 2 yr., resigning in 1893 to become president of the Maine State College, soon to broaden its name and function as the University of Maine. His formal leadership of the Office was brief and marked by few changes in policy, but it was a period of consistent development. In his report for 1892 he drew special attention to the fact that "with a technical force consisting of 6 persons and a clerical force consisting of 5 persons, the Office has issued during the year over 2,000 printed pages, equivalent to one 8-page document for each working day of the year, and to do this has read and abstracted over 20,000 pages of printed matter containing reports of American work in agricultural science, besides preparing abstracts of foreign publications, attending to correspondence, filing of documents, translations, visiting of stations, etc."

Increasing contacts with the individual stations were effected by visitation and otherwise, and cordial relations characterized what might have been a somewhat critical transition stage. Among other phases, Dr. Harris was personally interested in the improvement of the experiment station publications, as well as those of the Office itself, and did much to bring about a larger measure of uniformity and a greater attention to bibliographical details. He also took an active part in organizing the comprehensive exhibits of the Office and the stations at the World's Columbian Exposition in Chicago in cooperation with the Association of American Agricultural Colleges and Experiment Stations.

With the transfer of Dr. Harris to college administration his immediate duties shifted to the field of education, but he continued to take an interest in experiment station affairs. His influence was

considerable, as was illustrated in 1893 when he offered a resolution proposing increased authority for the Office of Experiment Stations and ultimately secured its adoption by the association in the following language: "Resolved, as the sense of this convention, that this association would welcome on the part of the United States authorities such inspection of expenditures by the several stations established under the act of 1887 as may be deemed proper by the General Government."

Dr. Harris was a consistent participant in the work of the association, filling numerous posts of responsibility, and in 1900 was elected president. His long-remembered address in that capacity dealt with "a few of the most important things for which the land-grant college stands, with a brief statement of the results accomplished." In this address he vigorously championed the work and aims of these institutions, declaring that "the land-grant and other State institutions having a common purpose and similar methods make a rare system, combining national aid and requirements with local control and administration in a manner fitted to produce the greatest efficiency and closely in keeping with our governmental methods. . . . It is a great result of the land-grant college to have asserted and established the doctrine that education in all its forms, from the lowest to the highest, is a State function in which the State has the fullest rights and for which it must bear responsibility, sharing the privilege and responsibility with private corporations only as it thinks best."

Hardly less important and even more unique was another paper read before the college section in 1898 on the Relation of the Churches to State Colleges and Universities, in which he pleaded for a realization of denominational responsibility for providing the students in these institutions with "religious care in a critical college period." This address was indicative of his intense interest in religious education, to which his later life was devoted. Following a period from 1901 to 1906 as head of a preparatory school in Maryland, he served for 10 yr. as president of Northwestern University and subsequently until retirement as corresponding secretary and secretary of the board of education of the Methodist Episcopal Church.

Thus his life as a whole was full and varied, but not the least of his many services was that to the land-grant institutions. Doubtless one of his major achievements was in helping to break down the barriers between the supposedly distinctive types of education to which in turn he devoted himself so whole-heartedly and so effectively.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and technological researches of the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1934, pp. 9-23, 24, 25, 46*).—Included are studies with sugarcane and sugarcane and sorgo-sirups; clarifying honey; utilization of whey; studies of sugar beets and maple products; utilization of sweetpotatoes for starch; inulin in chicory; frozen youngberries and use of youngberries for wine making; preservation of apple juice; fermentation flavors in sirups and molasses and fermentation of hays; spoilage in white sugar sirups; frozen peas; effect of germinated wheat on flour; staling of bread; studies of the waxlike coating of apples and the waxlike fraction of waste pomace; the ether extract of grape pomace; the yellow pigment of Grimes Golden and Jonathan apples; the toxicity of fluorine compounds; rancidity in cottonseed oil, corn oil, and lard; oil treatment of shell eggs and preserving broken-out eggs; preparation of grapefruit juice and pulp; pasteurization of orange juice; enzyme studies in eggs and other foods; hides and skins; utilization of waste hemlock bark; leather; turpentine and rosin; weather-proofing of cotton; deterioration of paper; oil content of soybeans; Patana oil; amino acids in soybeans; the proteins of yeast; fast dyes of agricultural fibers; and cellulose decomposition by *Chaetomium* spp.

[Bacteriological chemistry investigations of the Wisconsin Station] (*Wisconsin Sta. Bul. 428 (1934), pp. 54, 55*).—Brief items in this report note the observation by M. A. Ingraham and E. B. Fred that carotenes can be synthesized by certain bacteria, and that additional sources of the stimulative substance for butyric acid bacteria (*E. S. R.*, 69, p. 771) have been found by E. L. Tatum, W. H. Peterson, and Fred.

[Phenyl isocyanate protein compounds and derivatives and their immunological properties], II, III, S. J. HOPKINS and A. WORMALL (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1706-1715; 28 (1934), No. 1, pp. 228-236).—This is a continuation of the work reported upon in the first paper of this series (*E. S. R.*, 71, p. 438).

II. *The gelatin compounds*.—Phenylureido and *p*-bromophenylureido gelatin prepared by the method described in the first paper gave marked precipitin and complement fixation reactions with antisera to phenylureido horse serum-globulin. "With the gelatin preparations the zone of maximum precipitation is found in higher dilutions than are the corresponding zones for phenylureido compounds of horse serum-globulin or of caseinogen. The difference does not appear to be related to the number of new groupings introduced. The precipitin reactions with these gelatin compounds are most pronounced when carried out at room temperature (15°-20° [C.]) or at lower temperatures, since there is a strong tendency for the precipitates to go into solution at 37°. Phenylureido and *p*-bromophenylureido gelatin when injected into rabbits over a long period fail to produce antibodies which are detectable by precipitin and comple-

ment fixation tests. The conclusion is reached, therefore, that the non-antigenicity of gelatin is not due solely to a deficiency in aromatic groupings."

III. *The amino-acid derivatives and serological inhibition tests.*—"Phenyl and *p*-bromophenyl isocyanate derivatives of several amino acids have been prepared, including those of α - and ϵ -amino-*n*-hexoic acids. Inhibition by these phenylcarbamido acids of the precipitin reaction between phenylcarbamido proteins and the corresponding antisera has been studied. Similar inhibition of the complement fixation reactions has been obtained. The phenylcarbamido acids from lysine and ϵ -amino-*n*-hexoic acid give complete inhibition, whereas equivalent amounts of the derivatives of α -amino-*n*-hexoic acid, leucine, alanine, tyrosine, etc., give moderate inhibition only. These serological inhibition tests offer, therefore, strong support for the view that the free amino groups of the intact protein molecule are the ϵ -amino groups of the lysine molecules."

The refractivity of heat-denatured egg albumin, H. A. BARKER (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 667-673).—The author reports measurements indicating that the refractivity of egg albumin increases with heat denaturation in alkaline solution. This increase is interpreted as a structural rearrangement within the protein molecule, and a brief summary of the literature also shows that "all of the properties which would be expected to be most sensitive to structural changes in the egg albumin molecule (in particular the optical properties) actually are altered. The unaltered properties are those which should be less sensitive to structural rearrangement." The specific refractive increment of egg albumin was found to be 0.00185 ± 0.00002 .

The reaction of nitrous acid with cystine and related sulfur-containing compounds, S. A. LOUGH and H. B. LEWIS (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 601-610).—The authors made a study of the reaction of a number of organic sulfur compounds with nitrous acid, finding, in part, that "the sulfur of cystine was oxidized rapidly to sulfate by nitrous acid, but it was impossible to effect the oxidation of more than 85 percent of the sulfur, even over a period of 144 hr. and with the frequent addition of a fresh supply of the oxidizing agent. . . . When thioglycolic acid reacted with nitrous acid, the gas not absorbed by the alkaline permanganate in the Van Slyke determination was shown by spectroscopic examination to be nitrogen. Since thioglycolic acid resembles cystine in the Van Slyke reaction in that extra nitrogen is produced and the sulfur is rapidly oxidized to sulfate, it is believed that the 'extra nitrogen' in the reaction between cystine and nitrous acid is in reality nitrogen formed as a result of the reduction of the acid simultaneously with the oxidation of the sulfur."

The synthesis of serine, M. S. DUNN, C. E. REDEMANN, and N. L. SMITH (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 511-517, fig. 1).—A 46 percent aqueous solution of ethoxyacetaldehyde (167 g), prepared by the oxidation of ethylene glycol monoethyl ether with sodium dichromate and sulfuric acid, was used for the synthesis of 36 g of analytically pure serine, the aldehyde having been first converted into its ammonia addition product by treatment with a methyl alcohol solution of ammonia, then into the aminonitrile by the further addition of liquid anhydrous hydrocyanic acid. The hydrolysis of the nitrile and the removal of the ethyl group were simultaneously effected by boiling with hydrobromic acid, and the serine hydrobromide yielded the free amino acid on treatment with lead carbonate and freshly precipitated lead hydroxide, followed by decomposition of the lead salt with hydrogen sulfide. This procedure was found to be both convenient and inexpensive.

The configurative relationship of thyroxine and tyrosine, A. CANZANELLI, C. R. HARRINGTON, and S. S. RANDALL (*Biochem. Jour.*, 28 (1934), No. 1, pp. 68-72).—Although the direct chemical synthesis of thyroxine from *l*-tyrosine

was not found practicable, the synthesis of an optically active thyronine from naturally occurring *l*-tyrosine was accomplished, and the *l*-thyronine so prepared was shown to be identical with the preparation obtained by the catalytic deiodination of a sample of *l*-thyroxine. "There can thus be no longer any doubt of the stereochemical relationship of natural *l*-thyroxine with natural *l*-tyrosine, and on chemical grounds at least we may feel secure in advancing the hypothesis that in nature thyroxine is derived from tyrosine."

Of the synthesis itself it is reported, in part, that "the ethyl ester of *n*-benzoyl-*l*-tyrosine was condensed with 3:4:5-triiodonitrobenzene by boiling in methyl-ethyl-ketone solution with potassium carbonate to give ethyl α -benzamido- β -[4-(3':5'-diiodo-4'-nitrophenoxy)phenyl]-propionate. (The object of employing 3:4:5-triiodonitrobenzene instead of the more obvious *p*-iodonitrobenzene is simply to improve the yield at the stage of the condensation; the subsequent removal of the 3':5'-iodine atoms offers no difficulties.) The ester was hydrolyzed to the free acid, which in turn was reduced with ferrous sulfate and baryta to the corresponding amino compound; the latter was deiodinated by catalytic hydrogenation in presence of palladized calcium carbonate, and the resulting iodine-free amino acid was diazotized in dilute hydrochloric acid solution. The *n*-benzoyl thyronine, which resulted on boiling the solution of the diazonium salt, was not isolated but was converted directly into *d*-thyronine by further boiling after the concentration of hydrochloric acid had been increased to 5 N."

It was then shown that "the thyronine obtained in this way had $[\alpha]_{5461} + 13.3^\circ$, while a sample of thyronine obtained by the catalytic deiodination of *l*-thyroxine ($[\alpha]_{5461} - 3.5^\circ$) had $[\alpha]_{5461} + 12.2^\circ$; a third sample obtained by deiodination of *l*-3:5-diiodothyronine (itself related to *l*-thyroxine) had $[\alpha]_{5461} + 13.9^\circ$."

The acids produced from sugar by a *Penicillium* parasitic upon *Aspergillus niger*, J. L. YUILL (*Biochem. Jour.*, 28 (1934), No. 1, pp. 222-227).—The author reports upon the action of a *Penicillium* parasite on *A. niger* upon sucrose solutions.

"In the presence of chalk, considerable quantities of calcium citrate and small quantities of calcium oxalate are formed; also the soluble calcium salt of an acid insoluble in water but soluble in alcohol. In acid solutions the insoluble acid is formed encrusting the mold and separating on the vessel, but detectable quantities of citric and oxalic acids are not formed. The insoluble acid also appears when sucrose is replaced in the medium by glucose or fructose. Citric acid is also formed from glucose and fructose when chalk is present. The insoluble acid is probably to be identified with 'glauconic acid I' of [N.] Wijkman,¹ originally found in cultures of a *P. glaucum*."

Note on the preparation of d-galacturonic acid in large quantity, S. MORELL, L. BAUR, and K. P. LINK (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 15, 16).—The authors of this contribution from the Wisconsin Experiment Station direct that 500 g of the crude residue obtained after treating a commercially available citrus pectic acid with CH_3OH containing dry HCl for 90 hr. be introduced slowly into 2 l of water at 70°C . with vigorous stirring. "After cooling to about 40° , 515 cc of $\text{N H}_2\text{SO}_4$ are added and the solution transferred to a 5-l round-bottom flask equipped with a condenser. The flask is heated on a steam bath for 40 hr. at a temperature of 90° – 93° (internal). The hydrolyzed solution is cooled to about 45° . Five hundred g of neutral lead carbonate are then added to the dark solution. After foaming has subsided somewhat, the solution is agitated violently for a half hour, heated to 45° , and placed

¹ Liebig's Ann. Chem., 485 (1931), No. 1, pp. 61-73.

in the ice chest overnight. The precipitated PbSO_4 and excess PbCO_3 are filtered away, and the resulting dark red solution treated with hydrogen sulfide. About 5 g of activated charcoal are added to the yellow filtrate. A stream of CO_2 gas is bubbled through the solution, which is then filtered and concentrated under diminished pressure at 45° to about 1 l. It is then poured into 6 l of absolute ethyl alcohol, whereupon a white precipitate separates. After standing in the ice chest for several hours, the solution is filtered and concentrated to a sirup at 45° ."

The crystallization is allowed to proceed under a slightly reduced pressure in a desiccator. "The *d*-galacturonic acid monohydrate ($\text{C}_6\text{H}_{10}\text{O}_7 \cdot \text{H}_2\text{O}$) crystallizes out slowly. In about 2 days the crystallization is usually complete. The product is collected on a Buchner funnel, washed with absolute alcohol, and dried at room temperature under diminished pressure. The yield of several trials varied between 100 and 115 g. The preparation obtained is usually analytically pure. It should sinter at 110° – 115° and melt at 159° – 160° , $[\alpha]_D^{25} = +54.0^\circ$ (final) calculated from the anhydrous form. If necessary, it is recrystallized from 90 percent ethyl alcohol. From the filtrate another 35 g can be obtained readily by repeating the procedure from the stage where the lead carbonate is added."

Glycerophosphoric acid, I, II (*Biochem. Jour.*, 28 (1934), No. 1, pp. 143–151, figs. 7; 152–156, figs. 6).—The first of these two papers deals principally with methods; the second with the application of the procedures found most useful to the examination of various lecithins, cephalin, etc.

I. *The recognition and separation of α - and β -glycerophosphates*, J. J. Rae, H. D. Kay, and E. J. King.—Various methods for determining the relative amounts of α - and β -glycerophosphates are described, and the application of one of these to unknown glycerophosphates is given in detail. An enzymic method for detecting small amounts of the β -isomeride in α -salts is described, and a method for the purification of the α -salt is outlined. An attempt to resolve the α -salt into its optical isomerides using an enzymic method and the alkaloids brucine and quinine gave no positive evidence of separation. The addition of molybdates and tungstates did not increase the rotation of glycerophosphoric acid to an extent such that it could be read.

II. *The glycerophosphoric acid of the naturally occurring phosphatides*, J. J. Rae.—The relative amounts of α - and β -glycerophosphates occurring in several natural phosphatides were determined by an enzymic method. "Egg lecithin contains a glycerophosphoric acid which is predominantly the β -form; liver lecithin contains about equal amounts of the α - and β -forms; whereas brain lecithin, brain cephalin, and calcium phosphatide contain predominantly the α -form."

The methylglycosides of the naturally occurring hexuronic acids, I–III (*Jour. Biol. Chem.*, 100 (1933), No. 2, pp. 385–396; 104 (1934), No. 1, pp. 183–188; 105 (1934), No. 1, pp. 1–13).—The three papers here noted form part of a serial contribution from the Wisconsin Experiment Station.

I. *The preparation of methyl-*d*-galacturonide*, S. Morell and K. P. Link.—A practical method for the preparation of methyl-*d*-galacturonide from the commercially available polygalacturonide of citrus pectin is given.

Dry hydrochloric acid in absolute methyl alcohol was found to hydrolyze the polygalacturonide partially with the simultaneous formation of the methyl ester of methyl-*d*-galacturonide. The latter could be deesterified to give excellent yields of methyl-*d*-galacturonide.

Chemical properties and physical constants of methyl-*d*-galacturonide methyl ester monohydrate, the barium salt of methyl-*d*-galacturonide, and methyl-*d*-galacturonide dihydrate are given.

II. *The kinetics of the hydrolysis of α -methyl-d-galacturonide*, S. Morell and K. P. Link.—The velocity of hydrolysis of α -methyl-d-galacturonide in *N* hydrochloric acid was measured at 60°, 70°, and 80° C. and was compared with the constants of α -methyl-d-galactoside obtained under identical conditions. The critical increments for both reactions were calculated by means of the Arrhenius equation. It was found that the velocity constants for both compounds were practically identical, and that the α -methyl-d-galactoside possessed a slightly higher critical increment. "It may be concluded that α -methyl-d-galacturonide contains a 6-membered ring. These observations lend further support to the contention that the stable forms of the hexuronic acids are pyranoside derivatives."

III. *Polygalacturonic acid-methylglycosides derived from pectin*, S. Morell, L. Baur, and K. P. Link.—Several polygalacturonic acids of varying molecular sizes and solubilities were isolated from citrus pectin by means of absolute methyl alcohol containing dry hydrogen chloride. The terminal units of these polymers contained methoxyl groups in glycosidic linkage. A homogeneous fraction containing approximately from 8 to 10 galacturonic acid units constituted the main portion of the mixture. The preparation of the methyl ester, the sodium and barium salts, and the free acid of this polygalacturonic acid-methylglycoside is described. The physical properties of these derivatives were found in good agreement with the molecular size deduced from chemical analysis. The bearing of these results on current theories concerning the structure of the pectic substances is discussed.

The propionic acid bacteria: On the mechanism of glucose dissimilation, H. G. WOOD and C. H. WERKMAN (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 63-72).—The authors of this contribution from the Iowa State College investigated the dissimilation of glucose by *Propionibacterium arabinosum* by means of repeated analyses during the course of the fermentation. The observations led to the following conclusions concerning the propionic acid fermentation:

"A nonvolatile, ether-soluble compound containing a carbonyl group is produced during the dissimilation of glucose by *P. arabinosum*. The fermentation of glucose by *P. arabinosum* yields a nonreducing compound. After the glucose is no longer present in the medium the fermentation continues with the conversion of this compound into propionic and acetic acids, CO₂, and possibly succinic acid. Experimental results . . . indicate that a donation of hydrogen by compounds of the yeast water occurs in propionic acid fermentations. . . . Proposed schemes of the propionic acid fermentation are shown to be incomplete."

The component fatty acids and glycerides of the milk-fat of Indian camels, D. R. DHINGRA (*Biochem. Jour.*, 28 (1934), No. 1, pp. 73-78).—The fatty acids of the milk fat of the camel were found to differ from those of cow, buffalo, goat, and sheep milk fats in that they show a lower content of fatty acids volatile in steam. "Camel milk fat can to a great extent be distinguished from the milk fats of other animals by its lower Kirschner and Reichert-Meissl values. The amount of the lower fatty acids is in decreasing order in the milk fats of the sheep, goat, cow, buffalo, and camel."

"The content of the fully saturated glycerides in camel milk fat is a function of mean unsaturation, like that of the milk fats of other animals. The component fatty acids of the fully saturated glycerides of camel milk fat are in somewhat different proportions to those in the milk fats hitherto studied. The composition of the fatty acids of the mixed saturated-unsaturated glycerides of camel milk fat is little different from that of most cow and buffalo butters, but more so from that of goat and sheep milk fats."

"From the point of view of general properties and of the component glycerides present, there seems no reason why camel milk fat should not be used as a substitute for cow, buffalo, etc., milk fats."

The chemistry of the coffee-bean.—II, **The composition of the glycerides of the coffee-bean oil**, R. O. BENGIS and R. J. ANDERSON (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 139-151, fig. 1).—Continuing work previously reported (E. S. R., 69, p. 167), the authors now report upon the composition of the oils obtained by extraction from the natural raw bean, the freshly roasted bean, and the roasted stale bean, and upon the component fatty acids of the glycerides.

"There is no appreciable loss or change in the amount of fat of coffee beans on roasting or aging. The fragrant odor and flavor of the fat from freshly roasted coffee disappears on aging and is replaced by an unpleasant rancid odor. A distinct increase in the water-soluble volatile acids occurs in the fat from the stale roasted beans.

"The unsaturated fatty acids, representing about 52 to 54 percent of the total acids, are composed approximately of equal parts of oleic and linoleic acids. The solid saturated fatty acids are composed mainly of palmitic acid, but small amounts of stearic acid and a tetracosanic acid are also present. An unsaturated, optically active, hydroxy acid of high molecular weight was present in all of the three fats examined."

The distribution and origin of sulphur in wool.—I, **Methionine in wool**, J. BARRITT (*Biochem. Jour.*, 28 (1934), No. 1, pp. 1-5).—The methionine content of the wools examined was found to lie between 0.44 and 0.67 percent of the dry weight, the methionine sulfur varying from 2.4 to 4.8 percent of the total sulfur. This quantity of methionine sulfur accounted for about 3 or 4 percent of the total sulfur in wool, "and does not seriously affect the previous conclusion that sulfur in wool occurs almost wholly in the form of cystine, though the possibility of undiscovered sulfur-containing amino acids must not be overlooked."

The suggestion is made that methionine occurs widely in feeding stuffs and grasses and may play an important role in the ultimate synthesis of wool and hair proteins.

The acidity of formaldehyde and the end-point in the formol titration, M. LEVY (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 157-165, fig. 1).—The titration constant of formaldehyde was found to follow the equation $\text{pK}'_f = 12.87 - 0.19F$ at 30° , F being the molar concentration of formaldehyde. "Deduction from the data at hand indicates that the maximum accuracy of the formol titration is obtained when the formaldehyde concentration is 6 to 9 percent at the end volume, neutral (pH 7) formalin is used, no correction for a blank is made, the amino acids are at as high a concentration as possible", and the end point fulfills certain specifications, including an end point pH value, for mixed amino acids, of about 7.9, and, for any single amino acid, an end point pH value to be calculated by means of an equation of which the derivation is shown.

Lipolytic enzymes.—I, **Studies on the mechanism of lipolytic enzyme actions.** II, **The influence of hydrogen ion concentration on activity of liver esterase**, H. SOBOTKA and D. GLICK (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 199-219, figs. 4; 221-230, figs. 5).—In the experiments described in the first of these two papers the activity of liver and pancreas lipolytic enzymes on a series of simple esters, diesters, and triglycerides was measured; the affinities and kinetics of both enzymes for tri-, di-, and monobutyrin were determined; the relative theoretical maximum velocities of hydrolysis were calculated;

the solubilities of the butyryns in enzyme solutions were measured and compared with their water solubilities; and the influence of octyl alcohol on the speed of hydrolysis and on the affinity of the above substrates for the enzyme was investigated.

The second paper takes up the results of measurements between pH 5 and 10 of the activity of human liver esterase in glycerol extracts of the fresh organ, and in preparations from acetone-dried liver, on triacetin, glycol esters, and simple esters. Activity-pH relationships of hog liver and pancreas esterase were also investigated.

In each paper detailed observations and conclusions are stated and discussed.

Further studies upon the purification and properties of malt amylase, H. C. SHERMAN, M. L. CALDWELL, and S. E. DOEBBELING (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 501-509).—The authors' experience (*E. S. R.*, 65, p. 11) in the purification of pancreatic amylase led them to continued efforts to increase the activity and presumable purity of preparations of malt amylase. These have resulted in the development of a new method by means of which preparations of a saccharogenic activity much higher than any previously reported for this amylase may be consistently obtained. This method consisted essentially of fractional precipitation of extracts of barley malt by ammonium sulfate, solution of the most highly active fraction, dialysis to remove sulfate, repeated fractionation by ammonium sulfate with solution and dialysis of the best fraction in each case until no further increase in the activity per milligram of solid in the dialyzed solution occurs, concentration of the final dialyzed solution, fractional precipitation by alcohol, and finally precipitation by alcohol and ether.

"A typical product of such a procedure formed approximately 10,000 times its weight of maltose from 2 percent starch in 30 min. at 40° [C.] . . . at a dilution of 1:9,000,000. The activities of these preparations on the scale of Sherman, Kendall, and Clark [*E. S. R.*, 24, p. 122] are 3,800 to 4,500. Thus, they show as high sugar-forming activity as the most active preparations of pancreatic amylase so far obtained."

The material thus purified contained about 16 percent nitrogen, showed all the ordinary protein color reactions, and also behaved like a typical protein in respect to precipitation and denaturation. The denaturation of the protein and the loss of enzymic activity coincided.

The specific effects of buffers upon urease activity, S. F. HOWELL and J. B. SUMNER (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 619-626, figs. 6).—This investigation showed that the activity of urease depends upon the type of buffer present, as well as upon temperature, pH, urea concentration, and salt concentration. The pH optimum for urease acting upon 2.5 percent urea was 6.4 for acetate, 6.5 for citrate, and 6.9 for phosphate. With 0.1 percent urea the optimum was 6.7 for acetate, 6.7 for citrate, and 7.6 for phosphate. The highest activity was exerted by urease in the presence of 1 percent urea and M/8 citrate buffer at pH 6.5. In phosphate buffer urease was active from pH 5 to 9, in citrate buffer from pH 4 to 8.5, and in acetate buffer from below pH 3 to 7.5.

The relation of microorganisms to carotenoids and vitamin A.—I, The occurrence of carotene in bacteria, M. A. INGRAHAM and C. A. BAUMANN (*Jour. Bact.*, 28 (1934), No. 1, pp. 31-40, fig. 1).—In this paper from the Wisconsin Experiment Station the authors present a general survey of the distribution of carotene in bacteria. Over 100 species of bacteria were used in this study. It was found that the presence of carotene could be roughly

predicted on the basis of the color of the organism, and it was generally present in organisms of an orange shade. No anaerobes were found to synthesize this pigment.

The amount of carotene produced by a given organism varied with the medium on which it was grown, and the content per gram of cells increased with age to a definite maximum after which it decreased quite rapidly. One organism produced a yield of 0.58 mg of carotene per gram of dry weight. This synthesis of carotene by bacteria which was demonstrated on synthetic mediums was of interest since these organisms did not contain chlorophyll.

The antineuritic vitamin.—V, The preparation of a vitamin concentrate suitable for parenteral use, E. H. STUART, R. J. BLOCK, and G. R. COWGILL (*Jour. Biol. Chem.*, 105 (1934), No. 3, pp. 463-466).—In this continuation of the series of papers noted previously (E. S. R., 69, p. 168), the authors describe the preparation of an activated Lloyd's reagent containing 0.25 international unit of vitamin B (B_1) per milligram of solid. This can be further purified to yield an activated Lloyd's reagent containing 2.5 international units per milligram, from which a solution can be obtained containing about 5 international units per milligram of total solids. The final solution has been shown by clinical tests to be suitable for parenteral use. The method, which depends upon the fact that vitamin B_1 can be removed in a purified form from Lloyd's reagent by concentrated hydrochloric acid, is described in detail.

Salts of ergosteryl sulfate: Preparation and antirachitic activity on irradiation in aqueous medium, S. NATELSON, A. E. SOBEL, and B. KRAMER (*Jour. Biol. Chem.*, 105 (1934), No. 4, pp. 761-765).—This investigation was undertaken in the hope of obtaining a water-soluble derivative of ergosterol capable of being activated antirachitically and safer to use than colloidal suspensions or oil solutions for intravenous injection.

The sodium, potassium, and lithium salts of ergosteryl sulfate and the lithium salt of cholesteryl sulfate were prepared and tested for their solubility in water. The lithium salts proved most soluble. Lithium ergosteryl sulfate was less soluble than the corresponding cholesteryl salt. All of the salts became active antirachitically on irradiation, as shown by administration to rats orally, subcutaneously, and intravenously.

Separation of cysteine from ascorbic acid by mercuric acetate, A. EMMERIE (*Biochem. Jour.*, 28 (1934), No. 1, pp. 268, 269).—The reagent used consisted of an aqueous 20 percent solution of mercuric acetate, which was allowed to stand 1 day before filtering on account of a slight initial hydrolysis. It was added drop by drop to the solution to be tested (which must be slightly acid, excess of acid being removed by CaCO_3 and filtration), till the precipitation was finished, the reaction taking place in a graduated centrifuge tube. "Care must be taken to avoid a large excess of mercuric acetate, which dissolves the precipitate more or less. After centrifuging, the solution is treated with H_2S . After filtration the solution is left standing overnight, the H_2S removed by nitrogen (controlled by lead acetate paper), and the titration is then carried out."

The determination of the membrane potentials of protein solutions and the valence of protein ions, G. S. and M. E. ADAIR (*Biochem. Jour.*, 28 (1934), No. 1, pp. 199-221, figs. 6).—The sources of error in measurements of the membrane potentials of protein solutions were investigated, and a method which can be applied to systems where the potentials are small and volumes of the solution available are restricted to 5 or 1.5 ml was developed. Equilibrium membrane potentials of a number of natural and derived proteins developed at 0° C. across collodion membranes and with respect to dialyzates of well-

defined H-ion concentration, with pH values ranging from 2.0 to 7.8 and salt concentrations from 0.005 to 0.16 M were measured; and it was found that the observed relationship between the membrane potential E and the concentration C_p , expressed in grams of protein per 100-ml solvent, is a close approximation to a straight line when E is less than 2 mv.

"The hypothesis is advanced that, from such measurements, it is possible to calculate the mean valence of the protein ions, symbolized n_p , by the formula $n_p = 0.00425 MJ (E/C_v)_0$, where M is the molecular weight of the protein and J the sum of the concentrations of the ions in the dialyzate multiplied by the squares of their valences. $(E/C_v)_0$ is the limiting value of the ratio at $C_v = 0$, determined by extrapolation. The hypothesis is consistent with measurements of the relationships between membrane potentials and protein concentrations and with additional evidence obtained from chemical analyses and osmotic pressure determinations on dilute solutions of edestin and on Congo red."

The spectroscopic identification of phenylalanine in protein material, W. F. ROSS (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 531-534, pl. 1).—The author determined the position of the ultraviolet absorption bands of tryptophan, tyrosine, and phenylalanine, finding that phenylalanine in pure solution shows "five distinct bands at 2,680, 2,640, 2,585, 2,525, and 2,480 a. u. . . . The peculiar absorption of phenylalanine may be used for its identification in proteins or their hydrolysates if the tryptophan and tyrosine present are minimal." This method was applied to gelatin and proteins from alfalfa, giving positive results for the presence of phenylalanine in each.

An improved method for the determination of acetyl values of lipids applicable to hydroxylated fatty acids, E. S. WEST, C. L. HOAGLAND, and G. H. CURTIS (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 627-634).—"The method consists in acetylating the sample with a measured quantity of a mixture of acetic anhydride and pyridine (either hot or cold), decomposing excess anhydride with a little hot water, and titrating with alcoholic alkali after the addition of sufficient butyl alcohol to give a homogeneous solution. The acidity of the material is determined in the same way on a sample treated with pyridine only, and this value is subtracted from the above titration. This result subtracted from the titration of a blank on the acetic anhydride-pyridine mixture gives the necessary data for calculating the acetyl value. The titration of all of the acids, both acetic and higher fatty acids, is very accurate when carried out in the butyl alcohol solution with alcoholic alkali. A large number of determinations may be run simultaneously, and the execution of the method leaves little to be desired from the standpoint of simplicity, accuracy, and time required."

It is also proposed to discard the accepted definition of the acetyl value and to redefine it as "the milligram of acetyl taken up per gram of substance."

Polarimetric determination of gluconic acid, T. A. BENNET-CLARK (*Biochem. Jour.*, 28 (1934), No. 1, pp. 45-47).—The specific rotation of *d*-gluconic acid was found to be increased about fortyfold in the presence of molybdates, with which the organic acid formed complex salts. The value of the increased rotation was shown to be unaffected over a considerable range by variations in the concentration either of the gluconic acid or of the molybdate. It was also shown that the presence of citric acid does not affect the value of the specific rotation of gluconic acid in a manner comparable with the effect on malate-molybdate mixtures. An 8-ml sample containing 78.4 mg of gluconic acid and 192 mg of citric acid in standard molybdate mixture gave a rotation of 3.96° in a 2-dm tube, sodium light at 22°C .; a specific rotation of $[\alpha]_D^{20} = 378^\circ$, which agrees rather well with the mean of the observations made under

like conditions but in the absence of citric acid. It is further noted that "the rotations of gluconic acid complexes with uranyl salts and molybdates are in the same direction, in contrast to the behavior of malates; hence polarimetric analysis of mixtures should be relatively simple."

The determination of amino-acids in wheat flour, L. W. SAMUEL (*Biochem. Jour.*, 28 (1934), No. 1, pp. 273-282, fig. 1).—J. H. Brown's modification² of the Sørensen amino acid titration method (E. S. R., 19, p. 808) was applied to flour extracts from the time of separation of the extract to 5 hr. after separation, the results leading to the conclusion that "proteolysis, as measured by the production of amino acids, did not occur in the flour extracts studied. For one flour of the four studied (a low grade) the amino acid determination made on the extract at varying pH values showed an increase with time if the solution were titrated to pH 9.0 before and after the addition of formaldehyde, but no increase if the titration were carried to pH 8.0 only. It is suggested that this is due to the enzymic production of substances containing carboxyl and amino groups and having a low acid dissociation constant, which do not titrate even in the presence of formaldehyde until pH 9.0 is reached."

The Foreman method (E. S. R., 44, p. 411) is considered unsuitable for flour extract amino acid determinations because of the necessarily large dilution with alcohol and the very small amino acid content of the extracts dealt with.

An investigation of a method for iron determination in blood, B. R. BURMESTER (*Jour. Biol. Chem.*, 105 (1934), No. 1, pp. 189-198).—In a contribution from the University of California Medical School and College of Agriculture the results of iron determinations obtained by the volumetric titanous salt, the colorimetric thiocyanate, and the colorimetric thioglycolic acid methods are compared with respect to blood prepared by the dry ignition, by sulfuric acid-hydrogen peroxide digestion, and by sulfuric acid and persulfate treatment followed by tungstic acid precipitation of the remaining protein. The experimental determinations gave evidence to show that the thioglycolic acid method of iron determination is as accurate as the volumetric titanium method, "and inasmuch as the thioglycolic acid method can be used in the determination of iron in the Wong filtrate with the same accuracy, this method is better adapted for the estimation of iron in relatively small quantities of whole blood. Evidence is also given to show that the colorimetric thioglycolic acid method is more accurate than the colorimetric thiocyanate method."

A simple adaptation of Kolthoff's colorimetric method for the determination of magnesium in biological fluids, A. D. HIRSCHFELDER and E. R. SERLES (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 635-645).—The authors of this contribution from the University of Minnesota find that the magnesium ions of the plasma can be determined colorimetrically with titan yellow or Clayton yellow in alkaline solution after the calcium has been precipitated out as oxalate. "This method avoids the necessity of precipitating the magnesium either as the phosphate (MgNH_4PO_4) or as the oxyquinoline compound, and is therefore much simpler and much more rapid than the methods previously employed." A micromethod for the accurate determination of magnesium and calcium in 0.1 cc of plasma is described. The colorimetric method could be used for determination of magnesium in urine, if the phosphates were first precipitated out with uranyl acetate.

A method for quick dry ashing of blood serum for the determination of sodium by the uranyl zinc acetate method, W. E. WILKINS (*Jour. Biol.*

² Jour. Bact., 8 (1923), No. 3, pp. 245-267, pls. 3.

Chem., 105 (1934), No. 1, pp. 177-179).—In this procedure the author prepares, as the ashing reagent, a warm saturated solution of magnesium nitrate, filters this, and adds 2 g of magnesium carbonate to each 100 cc of the nitrate solution.

For the ashing itself, he directs that one "deliver 1 cc of serum into a 50-cc sillimanite crucible, add 1.5 to 1.6 cc of the $\text{Mg}(\text{NO}_3)_2 \cdot \text{MgCO}_3$ mixture, and mix thoroughly by gently rotating the vessel. Boil gently in a hood over a low flame until brown fumes begin to be freely given off and the mixture comes almost to dryness, then turn on the full flame. Within about 1 min. a clear white ash is obtained. If the material has not been permitted to boil too vigorously, the ash will not extend up more than about half an inch on the walls of the vessel. Continue heating until brown fumes cease to come off. Permit the vessel to cool, moisten the ash with a few drops of water (0.2 to 0.4 cc), add 1.5 cc of concentrated hydrochloric acid down the walls of the crucible, and stir with a short glass rod until the ash is completely dissolved. The stirring may usually be omitted if the mixture is permitted to stand for a few minutes."

From this point on he uses a modification of the Kolthoff sodium precipitation method (E. S. R., 58, p. 608).

A horizontal micro-burette, E. J. CONWAY (*Biochem. Jour.*, 28 (1934), No. 1, pp. 283-287, fig. 1).—A simple microburette which can be easily assembled from Pyrex thermometer tubing and graduated tubing is described. "It delivers volumes of the order of 0.1 ml and may be used for all microtitrations. It is particularly suitable for titrating quantities of acid of the order 10^{-6} equivalent or less. Its error for delivering 0.1 ml expressed as a coefficient of variation is 0.12 percent. Its error for titrating 1 ml of 0.0002 N sulfuric acid is 1.7×10^{-6} expressed as a standard deviation in millimoles of alkali."

It was further shown that the instrument "can be used for the very accurate delivery of small volumes of fluid of which a comparatively large quantity is available. It will deliver 0.1 ml with from one-half to one-third the error of an Ostwald pipette, and more accurately than the ordinary analytical balance can be relied upon to weigh. It may be used as a very accurate wash-out pipette for very small volumes of blood or serum. In using it for this object water is sucked up in tube F . . . to the highest level, the meniscus in the graduated tube being previously adjusted to some point near the end of the graduations. On opening the delivery tap there is now a suction pressure created which may be used to suck in a volume of blood which will be registered by the movement of the meniscus in the graduated tube. The exact volume taken in is thus measured and may then be delivered with an exact volume of wash-out water. It will be seen that this method is very convenient for small volume measurements which need not be exactly represented by tenths of a milliliter."

AGRICULTURAL METEOROLOGY

Handbook of climatology, II (H), III (L-M), V (X), edited by W. KÖPPEN and R. GEIGER (*Handbuch der Klimatologie*. Berlin: Borntraeger Bros., 1932, vols. 2, pt. H, pp. [3]+74, figs. 13; 3, pt. L, pp. VII+124, figs. 24; 3, pt. M, pp. IV+288, figs. 67; 1933, vol. 5, pt. X, pp. IV+19, figs. 8, rev. in *Nature* [London], 133 (1934), No. 3352, p. 144).—These parts of what is planned to be a 5-volume treatise on world climatology deal, respectively, with Climatology of Central America, by K. Sapper; Climate of Northwestern Europe and the Islands from Iceland to Franz Josef Land, by B. J. Birkeland and N. J. Föyn; Climatology of Central and Southern Europe, by E. Alt; and, in English, The Climate of

Rhodesia, Nyasaland, and Mozambique Colony, by C. L. Robertson and N. P. Sellick.

Methods of seasonal weather forecasting at the Scripps Institution of Oceanography, G. F. McEWEN (*Bul. Amer. Met. Soc.*, 15 (1934), No. 11, pp. 249-256).—The subject of weather forecasting is approached in this article from the standpoint of physical oceanography and is dealt with under correlation methods, cycles, and cosmical influence.

The practical application of weather data to crop planning, E. W. GREENE (*Assoc. Hawaii. Sugar Technol. Rpts.*, 13 (1934), pp. 89-91).—This article discusses briefly the adaptation of agricultural practices to weather conditions and the kinds of weather information which it is necessary to have for this purpose. "A collection of weather data, considered only by itself, cannot be used to any considerable effect in the practical conduct of crop production. When used in conjunction with the many other factors which must be taken into consideration in the striving for optimum economic results which we call intensive agriculture, weather data can be most valuable."

Of the less developed study of sunshine and intensity of light as weather factors, the author says: "It is probable that an instrument merely recording periods of sunshine and cloudiness is not as good an indicator as a device such as that which has been worked on by several members of the [Hawaii Sugar] Experiment Station staff and which records light intensity by finer gradations."

The 1934 drought (*U. S. Dept. Agr., Weather Bur. Rpt.*, 1934, pp. 4-7).—It is stated that the "widespread severe drought during the crop-growing season of 1934 adversely affected the principal grazing and grain-producing areas of the country to an unprecedented extent." The drought became established to such an extent as seriously to affect agriculture first in the Northwest, early in the spring. Thence it spread rapidly southeastward, southward, and southwestward. By early September it was in large measure relieved.

The severity of the drought was aggravated in many parts of the country by unprecedentedly high temperatures. In addition scarcity of snow in the western mountains resulted in a shortage of water for spring and summer irrigation in many western sections where irrigation is practiced.

Rainfall deficiencies in different States and regions are given, and the extent, distribution, progress, and severity of the drought are briefly discussed.

Vertical distribution of temperature in forests [trans. title], P. SELTZER (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 9, pp. 534, 535; *abs. in Rev. Sci. [Paris]*, 72 (1934), No. 21, p. 725).—A higher temperature and less pronounced temperature gradient was observed in forests than in the open whether the trees were in leaf or bare. Thus forests may have a double protective influence on young vegetation near the ground. Certain diurnal and nocturnal variations in distribution of temperature are noted.

The shelter belt tree planting project, H. H. CHAPMAN (*Jour. Forestry*, 32 (1934), No. 8, pp. 801-803).—The proposal to plant 100 continuous belts of trees 1,000 miles long across the central part of the United States from north to south is characterized as "fantastically impossible", and fostered by "many unscientific statements regarding the effect of forests upon climate and rainfall."

Marginal land and the shelter belt, E. HUNTINGTON (*Jour. Forestry*, 32 (1934), No. 8, pp. 804-812, fig. 1).—The proposed "shelter belt" project is condemned as almost certain to break down under unfavorable climatic conditions, and it is suggested that "the wise plan is to study the possibilities of shelter belts by means of small experiments, find out how to make reliable long-range weather forecasts, and meanwhile to convert the shelter belt region and the areas farther west into a safe and prosperous cattle country."

Forest Service reports start of work on shelter belt (*Jour. Forestry*, 32 (1934), No. 8, p. 887).—It is stated that preliminary work has been begun on the shelter belt project with an allotment of \$1,000,000. Administrative offices have been established at Lincoln, Nebr., with Paul H. Roberts in charge. The Lake States Forest Experiment Station is working on the technical phases of the project under the direction of Raphael Zon.

Meteorological observations, [September–October 1934], C. I. GUNNESS and A. H. MADDEN (*Massachusetts Sta. Met. Ser. Buls.* 549–550 (1934), pp. 4 each).—The usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

SOILS—FERTILIZERS

[Soil and fertilizer studies of the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt.*, 1934, pp. 36–40, 41–46, 47–53).—The work reported upon has included soil erosion investigations, fertility investigations with cotton, potato, sugarcane, strawberry, pecan, and citrus soils, fertilizer studies with sugar beets and peaches, concentrated fertilizers, green manure, mechanical placement of fertilizers, soil-type responses to magnesium compounds, CO_2 produced on boiling soils, relation of colloids to clay pans, infertile soils, the *Aspergillus niger* test for soil deficiencies, strain variation in *Azotobacter*, arsenic and selenium fungi, soil fungi as allergic excitants, catalysts in nitrogen-fertilizer investigations, physical constants of gases and fertilizer salts, peat as a nitrogen carrier, nitrogen fixation by *Azotobacter*, and preparation of phosphate fertilizers and mixed fertilizers.

[Soil and fertilizer studies by the Missouri Station] (*Missouri Sta. Bul.* 340 (1934), pp. 72–77).—Data are reported from trials of the effect of the fineness of grinding agricultural limestone, by W. A. Albrecht; work on the accumulation of organic matter on soils, by Miller, Albrecht, and H. Jenny; soil treatments to maintain good tilth, by Miller and Krusekopf; Missouri pastures improvement work, by Miller, Krusekopf, M. Brown, and Jenny; improvement of heavy clay subsoil, by Bayer; observations of the water content of soil colloids as related to their chemical composition, by Bayer and G. M. Horner; brief reports on water intake and swelling of soil colloids, by Bayer and H. F. Winterkorn; the use of nitrate of soda on Corn Belt crops, by Miller and R. L. Lovvorn; soil porosity as an index of structure, physical and chemical properties of the Iredell and Davidson soils affecting erosion, and the aggregation of soils, all by Bayer, C. W. Woodruff, and J. F. Lutz; correlation between exchangeable bases and pasture vegetation, by Jenny and E. R. Shade; interference of base exchange by micro-organisms, availability of absorbed calcium, and mechanism of ionic exchange in colloidal aluminum silicates, all by Jenny and Shade; results on the outlying experiment fields, by Miller and Krusekopf; and the effects of different soil treatments, long continued, upon bacterial activity in the soil, by Albrecht.

[Soil and fertilizer investigations at the Wisconsin Station] (*Wisconsin Sta. Bul.* 428 (1934), pp. 55–62, figs. 3).—These have included studies by P. W. Wilson et al. of a relationship between photosynthesis and nitrogen fixation in leguminous plants; experiments by R. M. Erickson, E. C. Saudek, and I. L. Baldwin showing that most root nodule bacteria do best in fertile nonacid soils; development of a new biological test for phosphates in soils, by A. Mehlich, E. Truog, E. B. Fred, and W. H. Peterson; Hancock Substation field experiments with fertilizers on sandy soils, by A. R. Albert; improvement of a potash test, by N. J. Volk and Truog; and improvement of yield and quality

of timothy hay by nitrogen fertilization and early cutting, by F. L. Musbach, G. B. Mortimer, and D. S. Fink.

Precautions to observe in making crop-acreage reductions and adjustments in North Carolina, C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 90* (1934), pp. [1]+5).—The importance of growing any crop only on the soil type which, of those found in the State, is best adapted for that crop is here noted, together with some crop-soil type adaptations believed to have been established.

A comparison between the pipette method and the hydrometer method for making mechanical analyses of soil, G. J. BOUYOCOS (*Soil Sci.*, 38 (1934), No. 5, pp. 335-345, pl. 1).—With the cooperation of the U. S. D. A. Bureau of Chemistry and Soils, the author of this contribution from the Michigan Experiment Station compared his hydrometer method for the mechanical analysis of soils (*E. S. R.*, 57, p. 710) with the standard pipette method, finding that what the pipette method determines as coarse clay (0.005 mm) the hydrometer method would determine at the end of 1 hr., and what the pipette method determines as fine clay (0.002 mm) the hydrometer method would determine at the end of 2 hr. "The results obtained show that the two methods agree exceptionally well on the determination of the coarser clay (0.005 mm). On the determination of the fine clay (0.002 mm) they do not agree very closely on some soils, but on the majority of soils they agree satisfactorily. The disagreement between the two methods in some soils seems to be due to differences in dispersion.

"A new stirrer is now employed in place of the original one. In this new stirrer the paddle is made of hard steel, and when it becomes worn it can be unscrewed from the stirring rod and replaced with a new one.

"On account of its great simplicity and rapidity, and its reasonable accuracy, it seems that the hydrometer method has many distinct advantages over all other methods."

A new method of measuring the aqueous vapor pressure of soils, N. E. EDLEFSEN (*Soil Sci.*, 38 (1934), No. 1, pp. 29-35, figs. 4).—The author of this contribution from the University of California describes an apparatus and technic, for the details of which the original should be consulted. The principal advantage of the present over preceding forms of the static method is that by a modification of apparatus and technic to permit the required measurements to be made in a high vacuum the time required for the attainment of equilibrium is greatly shortened. The data recorded include aqueous vapor pressure curves, permanent wilting percentages, and field capacities for a fine sandy loam, a clay loam, and a half-and-half mixture of the two. A theoretical equilibrium system illustrative of colligative properties of soil moisture is considered from the viewpoint of energy relation calculations, and the derivation of certain equations is shown.

The physical and chemical characteristics of the soils from the erosion experiment stations.—Second report, H. E. MIDDLETON, C. S. SLATER, and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 430* (1934), pp. 63, figs. 7).—The bulletin reports a detailed study of profiles of Muskingum silt loam (Ohio), Clinton silt loam (Wisconsin), and Nacogdoches fine sandy loam (Texas), supplementing the work previously noted (*E. S. R.*, 68, p. 22).

The determinations made include mechanical analyses, chemical analyses of both soil and colloid, specific gravity, field volume weight, porosity, dispersion ratio, erosion ratio, moisture equivalent, and a number of other moisture relationships.

"A study of the eroded material shows marked differences in the quantity and character of the wash-off. When the quantity of eroded material is large it is similar in character to the whole soil. When the erosion is slight, the fine material predominates. Slight erosion, therefore, may be relatively more detrimental to fertility than more severe erosion. These data supplemented by the field data on rainfall, run-off, and erosion reported from the stations show that erosional effects vary greatly with the kind of soil, the amount and intensity of rainfall, the kind of crop and cultivation, the slope, and perhaps other factors."

Sorption of liquids by soil colloids.—I, Liquid intake and swelling by soil colloidal materials, H. WINTERKORN and L. D. BAVER (*Soil Sci.*, 38 (1934), No. 4, pp. 291-298, fig. 1).—Of the set-up used, it is stated that "the apparatus most frequently used . . . consists of a Jena glass tube with a fused-in sintered-glass filter disk; the Jena tube was connected to a [horizontal] microburette by a small glass tube. The microburette had a capacity of 1 cc and could be read to 0.002 cc. When the swelling of bentonite was measured, a three-way stopcock connected to a water reservoir was inserted between the Jena glass tube and the microburette. Such a connection permitted the introduction of more water as sorption progressed. Liquids which dissolve or attack stopcock grease cannot be used with the stopcock connection, however."

The remainder of this communication from the Missouri Experiment Station consists of a report on measurements of the sorption of various liquids by powdered soil colloids. It appeared that swelling, defined as the difference between sorption of swelling liquid and intake of nonswelling liquid, is a function of form and intensity of the electric field around the liquid molecules. The swelling of soil colloids in liquids having a waterlike structure, as related to the dielectric constant, is said to be expressed more or less quantitatively by the equation

$$\frac{L-P}{L'-P} = k \frac{D}{D'}$$

The influence of the SiO_2 -sesquioxide ratio and the nature of the adsorbed cation was also studied.

The laws of soil colloidal behavior.—XIV, The electrokinetics of hydrous oxides and their ionic exchange, S. MATTSON and A. J. PUGH (*Soil Sci.*, 38 (1934), No. 4, pp. 299-313, fig. 1).—The present installment of this serial contribution (E. S. R., 70, p. 588) from the New Jersey Experiment Stations deals with the isoelectric point and ionic exchange of a number of hydrous oxides.

"A general relationship is observed between the position of the isoelectric point and the acidic or basic properties of the elements. Their electrokinetic behavior, however, is not always indicated by their position in the periodic table, apparently because of differences in dissociation of the various compounds and of the fact that the isoelectric point does not coincide with the isoionic point. The hydrous oxides isoelectric below pH 7.0 adsorb and exchange cations at this pH, a capacity which increases as the isoelectric pH decreases. The adsorption of anions increases with diminishing pH, in the reverse order to cationic adsorption."

Laws of soil colloidal behavior.—III, Colloidal phosphates, A. J. PUGH (*Soil Sci.*, 38 (1934), No. 4, pp. 315-334).—It is noted that the first two papers of this serial contribution (E. S. R., 72, p. 162) from the New Jersey Experiment Stations were erroneously included in Mattson's series (see above) of similar title.

In the experiments reported upon in the present paper a series of phosphate precipitates of tin, titanium, iron, aluminum, calcium, and magnesium were prepared, and their cataphoretic behavior and phosphate content at different pH were determined.

"Tin and titanium have strong acidic properties and only weakly adsorb phosphoric acid. The compounds, however, are very insoluble and stable in acid solutions, but are dispersed when the pH is increased to about pH 6.0. The phosphates of ferric iron and aluminum are of the same type, but ferric phosphate is more stable in the very acid ranges than is aluminum phosphate. Calcium phosphate is insoluble within a pH range from neutral to strongly alkaline. Magnesium phosphate is less stable than calcium phosphate and more susceptible to both acid and alkaline hydrolysis. By increasing the pH the phosphate content of the precipitates of tin, titanium, iron, and aluminum is diminished, the hydroxyl replacing the phosphoric acid. Two effects are, however, apparent—the replacement of the phosphoric acid by the hydroxyl groups, and the necessity of having a certain degree of pH in order to obtain the requisite degree of polymerization of the molecules and prevent both acid and alkaline hydrolysis. Since only the pH has been determined in this case, there is no means of deciding the number of hydroxyl groups required to replace the phosphoric acid. On the theory of coordination, however, and in the absence of double bonds, only one hydroxyl group would be required to replace a large group like H_2PO_4 or HSiO_2 ." The significance of electrokinetic potentials and the isoelectric point is discussed.

Functional relationships between soil properties and rainfall, H. JENNY and C. D. LEONARD (*Soil Sci.*, 38 (1934), No. 5, pp. 363–381, figs. 11).—In an investigation continuing earlier work on soil moisture-nitrogen relationships (*E. S. R.*, 63, p. 419), the authors of the present contribution from the Missouri Experiment Station collected numerous soil samples along the 11° C. isotherm from "fairly uniform parent material consisting primarily of wind-blown deposits." The variations in annual rainfall cover a range of from 35.6 to 96.5 cm. (14 to 38 in.).

"The zone of carbonate accumulation was found to decrease at a rate of 2.5 in. for each inch of rainfall. Nitrogen increases continuously with increasing rainfall. The functions obtained confirm those previously published. Under high rainfall the formation of colloidal clay is intensified. It increases at a rate of about 1 percent per inch of rainfall. Soil acidity changes regularly from pH 7.8 in the semiarid region to pH 5.2 in the semihumid one. Neutral reaction is reached at about 25 in. of rainfall (N. S. Q.=195). Exchangeable H ions appear at 26 in. of rainfall (N. S. Q.=202), and become very numerous in the semihumid region. The saturation capacity has a value of 12 m[illigram] e[quivalents] per 100 g of soil in the semiarid region and increases logarithmically to 27 in the semihumid areas. The exchangeable bases exhibit a maximum (21 m. e.) at a rainfall of 26 in. (N. S. Q.=202). On the basis of differential coefficients the relative rate of formation is highest for the H-ion concentration and removal of carbonates. It is lowest for the clay formation and development of saturation capacity. Nitrogen and organic matter occupy an intermediate position. The boundary between arid and humid climates as based on the soil properties investigated appears to correspond to a rainfall of 25–26 in. (N. S. Q. 200) for the 11° isotherm."

Anion exchange.—II, Liberation of the phosphoric acid ions adsorbed by soils, S. RAVIKOVITCH (*Soil Sci.*, 38 (1934), No. 4, pp. 279–290, figs. 4).—Paper No. 1 of this series has already been noted (*E. S. R.*, 72, p. 162).

The soil material used in the experiments here described was prepared by treating certain red sandy and clay soils with dilute phosphoric acid to satu-

rate the base-exchange complex with H ions and to bring about an absorption of phosphate ions. The phosphate not absorbed during this treatment was washed out by dialysis in collodion bags.

"The exchange reactions, which begin as $\text{Ca}(\text{OH})_2$ or NaOH solutions are added to the soil, proceed in two phases. In the first phase only a cationic exchange takes place between the Ca or the Na ions of the introduced solutions and the exchangeable H ions which are in equilibrium with the hydroxyl ions. As the replacement of these H ions is complete, the second phase of the exchange reactions proceeds. This exchange is anionic as well as cationic. It proceeds between the OH ions of the $\text{Ca}(\text{OH})_2$ or NaOH solutions and the adsorbed PO_4 ions and, simultaneously, between the Ca or Na ions of the solutions and the exchangeable hydrogen ions which are in equilibrium with the adsorbed PO_4 ions. . . .

"The amount of PO_4 recovered in the solution, after all exchange reactions have taken place, appears to be the result of a final established equilibrium between the liberated PO_4 , on one side, and the exchange complex, the products of its destruction, and the electrolytes of the solution, on the other."

Phosphate studies.—I, Soil penetration of some organic and inorganic phosphates, V. E. SPENCER and R. STEWART (*Soil Sci.*, 38 (1934), No. 1, pp. 65-79, fig. 1).—"Availability", unqualified, is defined by the authors of this contribution from the Nevada Experiment Station as involving the two distinct factors of chemical and of positional availability, emphasis being placed upon the requirement that the plant food material, no matter how readily available chemically, must be within reach of the root system of the plant if it is actually to be utilized by the plant.

The experimental work reported upon is designed to show the effect of the combination of the phosphate radical with polyhydroxylated organic radicals in preventing the fixation of the phosphates applied to the soil in the form of difficultly soluble compounds. The type of compound found to escape fixation because of its organic component is that of such salts as the calcium salt of glycerol mono-orthophosphate and potassium sorbityl diorthophosphate. The penetration of soils by such compounds and their freedom from appreciable fixation is shown experimentally, and their chemical availability is discussed.

The determination of phosphate availability in calcareous soils by electrodialysis, W. T. MCGEORGE (*Soil Sci.*, 38 (1934), No. 5, pp. 347-353, figs. 2).—Electrodialysis was found an effective means for the determination of the available phosphate content of the alkaline calcareous soils reported upon in this contribution from the Arizona Experiment Station, in that the pH values of the aqueous suspensions could be reduced to as low as pH 4.0 in spite of the excess of calcium carbonate present.

"The percentage of phosphate which can be extracted by electrodialysis is a constant value for every soil regardless of the amount of soil used. On the other hand, the value varies with the amount of current flowing, and amperage must be controlled by adjustable resistance to produce comparative results. There is a close relation between Neubauer values [*E. S. R.*, 53, p. 319] and amount of phosphate removed from soils by electrodialysis."

The arsenic content of soils, J. E. GREAVES (*Soil Sci.*, 38 (1934), No. 5, pp. 355-362).—A contribution from the Utah Experiment Station reports upon the analysis of 50 orchard soils, varying widely in chemical, physical, and biological properties, for total arsenic, water-soluble arsenic, and various soluble salts. Total arsenic varied from 7.2 to 367.2 lb. per acre-foot of soil, thus indicating that "large quantities" of arsenic may accumulate in soil. The water-soluble arsenic varied from 0.7 to 31.9 lb. per acre-foot of soil.

"It is probable that the toxicity of arsenic to plants and to soil micro-organisms is governed by the solubility of the soil arsenic. Hence, the correlation between various soluble salts and soluble arsenic in the soil was determined. The limited number of soils analyzed, together with the high probable error, makes the conclusions merely tentative. No correlation was found to exist between water-soluble arsenic and total soluble salts, sodium chloride, sulfates, calcium carbonate, and organic nitrogen of the soil. A slight correlation was found to exist between the water-soluble arsenic and sodium carbonate and nitrate."

Studies on tropical soil microbiology.—II, The bacterial numbers in the soil of the Malay Peninsula, A. S. CORBET (*Soil Sci.*, 38 (1934), No. 5, pp. 407-416, fig. 1).—In continuation of a report recently noted (E. S. R., 71, p. 15), the author of the present contribution from the Jealotts Hill Research Station, England, shows that under the equatorial conditions prevailing in the humid tropics of the Malay Peninsula, the number of soil micro-organisms, as determined by the usual plate-counting method, is constant under all normal conditions and approximates a value of 500,000. The results are considered to suggest that fluctuations in bacterial numbers in the soil are primarily functions of changes in the temperature and moisture content, and that when these factors are maintained constant no variations in bacterial numbers are apparent. "On almost all the plates examined fungi predominated over bacteria, indicating that these organisms play an important role in the decomposition of soil organic matter in the humid tropical regions."

The microflora of Kazakstan sands (central Asia), E. E. PAULIE (*Soil Sci.*, 38 (1934), No. 5, pp. 401-406).—The author finds, in part, that in the soils examined there are two maxima, one near the surface at a depth of from 5 to 20 cm, the other near the water-bearing layer at a depth of from 175 to 200 cm. "The bacilli often surpass the cocci in numbers. At the same time the numbers of bacilli and *Azotobacter*-like cells change more or less regularly with depth, and their quantity depends upon the general number of microbes. The number of cocci varies irregularly; sometimes the cocci are completely absent. The counting of other forms is generally difficult because many of them cannot be fixed with alcohol (spores) or they are destroyed during the fixation (infusoria)...."

"The microbiological investigation of the Kazakstan sands shows that even those semidesert sands are not free from a definite microflora."

Studies on soil protozoa, F. S. BODENHEIMER and K. REICH (*Soil Sci.*, 38 (1934), No. 4, pp. 259-265, fig. 1).—Protozoa isolated from a yellow-brown, loamy, calcareous, shallow wheat-field soil, containing 55.5 percent of calcium carbonate in the finer portion as well as numerous undecomposed limestone fragments, are described. The soil was a poor one, primitively worked, but unmanured.

Of the Ciliata, the one species *Colpoda steinii* was recognized. The Flagellata found were a *Cercobodo* sp., together with *Heteromita globosa*, *Pleuromonas jaculans*, and *Cercomonas longicauda*. The Rhizopoda included *Mayorella palestinensis*, *Microamoeba oblonga*, three *Amoeba* spp. of the *limax* group, and an *Amoeba* sp. of the *proteus* group. The method of destroying active forms by treatment overnight with 2 percent hydrochloric acid to determine the number of protozoa present in the form of cysts was found unsatisfactory in that some at least of the cyst stages were also killed.

The upper limit of heat tolerance, both in dry soil and in moist material from cultures, was determined for the *Cercobodo* sp., for *Colpoda steinii* and *Mayorella palestinensis*, and for an *Amoeba*, identified only as "No. 2." For these

four species the moist heat tolerances were, respectively, 50°, 60°, 65°, and 65° C., whereas in dry soil the figures were, in the same order, 80°, 80°, 85°, and 80°.

Profile studies of the Coastal Prairie soils of Louisiana.—I, Exchange and solution properties. E. A. FIEGER and M. B. STURGIS (*Soil Sci.*, 38 (1934), No. 4, pp. 267-277).—The authors estimated replaceable bases, base-exchange capacity, H-ion concentration, total soluble salts, and soluble alkali in eight soil profiles of the Coastal Prairie Area of Louisiana, "selected purposely for studying the effect of irrigating waters upon their chemical properties and changes of their physical state."

The irrigation of the soil appeared to cause an increase in the total exchange capacity and an increase in alkalinity. "This may be due to the hydrolytic action of water itself, alone or in combination with monovalent basic ions. It appears that the hydrolytic effect is accentuated by the reducing conditions and lowered carbon dioxide production which follow from flooding and irrigation. The use of saline irrigating water resulted in the greatest increase in the amount of replaceable sodium in the exchange complex, whereas deep well water caused the smallest increase, but in all cases flooding or irrigation caused an increase in comparison with nonflooded soils. The soluble alkali content was low, and in the case of the nonflooded soils no free alkali was present. In accordance with the work of others, it was found that there is no well-defined relationship between the amount or the proportion of exchangeable sodium and the impermeability of the soil to water. Excessive accumulations of soluble carbonate (black alkali) and other soluble salts account for the fact that some of the mounds in rice fields are bare."

Typical profiles showed degradation extending from the A horizon well into the B horizon, this degraded material being considered to have resulted from the effect of the replacement of other ions in the exchange complex by sodium and also from the effects of reduction and hydrolysis.

Base exchange studies on the Pennsylvania Jordan field plots, F. G. MERKLE (*Soil Sci.*, 38 (1934), No. 1, pp. 37-64, figs. 3).—An investigation into the effects of various fertilizer treatments upon the base-exchange capacity and exchangeable base content of the soils of the Jordan fertility plats (E. S. R., 65, p. 301) is reported upon in a contribution from the Pennsylvania Experiment Station.

In general, "cultivation has resulted in a small decrease of exchangeable calcium and magnesium without an increase in exchangeable hydrogen. The quantity of exchange ammonium in the grass strips is two to three times greater than in the check plats."

Barnyard manure caused an increase in total exchange capacity, the increase being mainly due to replaceable hydrogen and magnesium. The quantity of other ions was not changed.

On those plats which had received large quantities either of burnt lime or of limestone, the soils were found saturated with calcium, a large quantity of calcium was present as carbonate, and the total exchange capacity had been increased. Replaceable magnesium was also higher on these plats, but the other cations were unaffected.

The continued use of a mixture of superphosphate and potassium chloride, as compared with the treatment of the check plats, resulted in an increase in total exchange capacity. This fertilizer combination decreased the replaceable calcium and increased the hydrogen content. Magnesium was unaffected, but potassium was decidedly increased.

Superphosphate alone caused neither increase nor decrease in calcium but did increase exchange hydrogen. "This fertilizer has resulted in a diminu-

tion of magnesium and potassium which is believed to be due to larger crop removals than on the check plats. Superphosphate increases soil acidity slightly. When compared with superphosphate, ground bone is found to increase replaceable calcium and the degree of saturation and to raise the pH value of the soil.

"Dried blood has resulted in marked loss of calcium and magnesium with corresponding increase in hydrogen. The amount of bases lost and of hydrogen gained is not directly proportional to the quantity of blood used. . . . The sodium of nitrate of soda was not adsorbed, and the quantity of other bases was not altered by the use of large amounts of nitrate of soda. Hydrogen was reduced and the total exchange capacity diminished by from 2 to 3 m[illigram] e[quivalents]. As a result of the use of large amounts of sulfate of ammonia over a period of 50 yr. there has been a marked decrease of calcium and magnesium and a small loss of potassium. Hydrogen has replaced these ions so that now the most acid plats are only 15 percent saturated. It is noteworthy that, although this salt has reduced the quantity of three bases, Ca, Mg, and K, the ill effects are apparently overcome by lime alone. It is pointed out that under field conditions it is not possible to determine, by calculation, how much lime is needed to counteract the acidity produced by an application of sulfate of ammonia.

"Muriate of potash appears to have replaced calcium by potassium. Though there has been a loss of calcium there has been no gain in hydrogen and no appreciable change in pH value."

The *Azotobacter* plaque test of soil deficiency as applied to some Indian soils. N. V. JOSHI and C. S. RAM AYYAR (*Indian Jour. Agr. Sci.*, 4 (1934), No. 1, pp. 166-176, pl. 1).—The *Azotobacter* plaque test of Winogradsky (E. S. R., 54, p. 119) was applied with slight modifications to a number of Indian soils of varying texture and pH values to determine phosphorus and potassium deficiencies. The minimum phosphate treatment required to stimulate *Azotobacter* growth in soils was found to be about eight times the quantity usually applied for crops, and the minimum potash requirement was not definitely established. The method did not prove to be sufficiently sensitive to detect the phosphorus and potassium deficiencies in all soils but may be useful for the rapid comparative examination of large numbers of soils and for comparing the availability of phosphatic fertilizers.

Tests for phosphate, nitrate, and soluble nitrogen in conducting tissue of tomato and lettuce plants, as indicators of availability and yield. E. M. EMMERT (*Kentucky Sta. Circ.* 43 (1934), pp. 25-40, fig. 1).—The lower petioles of tomatoes were analyzed for nitrate nitrogen and phosphate phosphorus. The midribs of lettuce were analyzed for phosphate phosphorus and soluble nitrogen. Yields were compared with the results of the analyses. The data presented are considered to indicate that the content of nitrogen and phosphorus in the conducting tissue of plants growing in the different soils corresponded well with the productiveness of the soils as measured by the yield; that "the effect of fertilizers is readily detected by the tests on the plants"; that the amount of nutrients in the conducting tissue of a plant seems to be definitely related to yield; and that the amount of phosphate in the conducting tissue was influenced by the amount of nitrate or soluble nitrogen present, a large amount of nitrogen decreasing the phosphate content.

Experiments with nitrogen fertilizers on cotton soils. J. J. SKINNER, R. A. LINEBERRY, J. E. ADAMS, C. B. WILLIAMS, and H. B. MANN (*U. S. Dept. Agr., Tech. Bul.* 452 (1934), pp. 28, figs. 4).—Results of experiments are reported showing the relative effects of various sources of inorganic, synthetic, and

organic nitrogen in fertilizers for cotton on the principal soils of the southeastern Cotton Belt, especially in North Carolina.

"On many soils there was not a wide variation in yield of cotton from fertilizers containing phosphoric acid and potash with different sources of nitrogen, such as sodium nitrate, ammonium sulfate, ammonium nitrate, urea, Leunaspeter, and ammonium phosphate. In some of the experiments ammonium chloride gave slightly lower yields. Fertilizers containing nitrogen derived partly from quickly available inorganic or synthetic nitrogen and partly from slowly available organic nitrogen of vegetable or animal-waste origin gave larger returns on some soils than fertilizers containing only quickly available inorganic or synthetic nitrogen, while on other soils quickly available nitrogen gave as good results as a mixture of the two types of nitrogen carriers."

Inspection of fertilizers, W. L. ADAMS and A. S. KNOWLES, JR. (*Rhode Island Sta. Ann. Fert. Circ.*, 1934, pp. 17).—The present interest, both of soil chemists and of fertilizer manufacturers, in producing fertilizers having little or no soil acidifying tendency is briefly discussed. Of the use, for this purpose, of "a sufficient quantity of a liming material, preferably dolomitic limestone", it is noted that "the use of this material would not cause apparent loss in plant food which would very likely occur if strongly basic materials were used. Another beneficial result from the use of dolomitic limestone is that magnesia is applied to the soil."

The usual tabulations of fertilizer analyses and other inspection data are given.

AGRICULTURAL BOTANY

A method of representing atmospheric conditions in agricultural ecology [trans. title], L. CHAPTAL (*Ann. Agron. [Paris]*, n. ser., 3 (1933), No. 3, pp. 359–365, figs. 2).—A system of plotting weather factors in diagram form devised by the author is used to interpret, by way of example, the epidemiology of grape mildew.

Study of the floral ecology of wheat relative to extreme temperatures [trans. title], G. RUDOLF and M. M. JOB (*Rev. Mus. La Plata*, 34 (1934), pp. 195–253, pls. 7, figs. 22).—The effects of unfavorable temperatures on the development of the essential floral organs, including ovules and pollen, were studied microscopically as a basis for choice of varieties for the locality.

Relation of chemical composition to photoperiodic effects in plants, A. E. MURNEEK (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), p. 175).—Chemical analyses at the Missouri Experiment Station of plants, mostly soybeans, exposed to 7- and 14-hr. day lengths in an attempt to induce physiological changes, showed that the reproductive short-day plants were higher in carotene, xanthophyll, and probably vitamin A, and had an increased percentage dry weight, a higher concentration of nitrogen compounds, and a greater accumulation of carbohydrates. A conspicuously low concentration of nitrate nitrogen was found in the tips of the stems of the 14-hr. plants. In all stems there was a descending gradient of nitrate nitrogen from the base to the top.

A biochemical study of the internal mechanism of photoperiodism, A. E. MURNEEK (*Missouri Sta. Bul.* 340 (1934), pp. 63, 64).—The results are discussed of studies of nitrogen metabolism in the stems of soybeans grown under long and short day lengths.

Shorter light rays increase nitrate utilization of wheat plants (*Wisconsin Sta. Bul.* 428 (1934), p. 24).—Brief mention is made of the work of W. E. Tottingham and E. J. Lease.

A plant test of the sun lamp, W. E. TOTTINGHAM (*Plant Physiol.*, 7 (1932), No. 3, pp. 551-553, fig. 1).—This contribution from the Wisconsin Experiment Station describes tests with tomato seedlings exposed for nine nights to a "sun lamp" providing ultraviolet light in comparison with plants exposed to a tungsten lamp under similar controlled conditions. The sun lamp radiation resulted in increased weight and an increased proportion of nitrogen compounds.

The effects of X-rays on growth and respiration of wheat seedlings, D. S. FRANCIS (*Bul. Torrey Bot. Club*, 61 (1934), No. 3, pp. 119-153, figs. 7).—Retarding effects were produced by all exposures on elongation, weight increase, and the production of CO_2 , except for a transitory increase in CO_2 after the shortest exposure.

Proof of mitogenetic radiation by a physical method [trans. title], L. PETRI (*Protoplasma*, 19 (1933), No. 3, pp. 365-369, figs. 2).—Mitogenetic rays were demonstrated by means of an improved microphotoelectroscope. The construction of the apparatus is described and illustrated. The method required long exposures. The Gurwitsch radiation occurred to an appreciable amount only when the sprouts of the germinated wheat grains were 2-4 mm long. Below 14°C . radiation was too weak to be observed.

A physiological study of dormancy in Tilia seed, J. N. SPAETH ([*New York*] *Cornell Sta. Mem.* 169 (1934), pp. 78, pls. 4, figs. 6).—The author studied nearly 50,000 seeds of basswood (linden) from New York, Wisconsin, and Indiana during a period of 3 yr. in order to learn the facts concerning the dormancy of such seeds and to devise means of securing prompt and abundant germination. The seeds were subjected to a wide range of conditions and treated with a large number of chemical substances, as well as with X-rays.

The pericarp was found not to be impermeable, but in order to set free the seeds for treatment it was partially digested with concentrated HNO_3 . Impermeability of a layer in the outer palisade of the testa was found to be a primary cause of dormancy, and appeared to be due to the presence of compact cellulose. From 10 to 30 min. in concentrated H_2SO_4 rendered the testa of all seeds permeable without injury. Other methods were ineffective or likely to be injurious. A membrane made up of the thickened outer end walls of the outer endosperm cells was found to admit water and certain solutes, but to exclude or limit absorption of other solutes and oxygen.

The embryos, when freed from the seed, were found not to be dormant, regardless of the age of the seed or the conditions under which it had been stored. Germination of acid-treated seeds took place in moist stratification at temperatures of from 0° to 10°C . in from 110 to 130 days. In such seeds the rate of germination is increased greatly by transferring them, as soon as germination starts, to temperatures above 20° .

The factor E content of leguminous seeds [trans. title], V. ZAGAMI (*Atti R. Accad. Naz. Lincei*, 6. ser., *Rend. Cl. Sci. Fis., Mat. e Nat.*, 19 (1934), No. 3, pp. 186-190).—The results are reported of rat-feeding tests for the presence of the fecundity vitamin in seeds of different species of Leguminosae.

On the pea test method for auxin, the plant growth hormone, F. W. WENT (*K. Akad. Wetensch. Amsterdam, Proc.*, 37 (1934), No. 8, pp. 547-555, fig. 1).—After discussing various standard technics for the demonstration of auxin, the author describes the pea test, which is held to be simpler and more convenient, as well as semiquantitative. Pieces of stem are split lengthwise and placed in the solution to be tested. The nature of the curvatures developed over a period of several hours at standard temperature in comparison with those developed in control solutions is indicative of the presence or absence of the hormone. The tests were compared with those made with

Avena, using the same solutions. Without exception, both tests gave exactly the same qualitative results and showed remarkable quantitative agreement. The probable mechanism involved is discussed.

Investigations with growth hormone paste [trans. title], F. LAIBACH (*Ber. Deut. Bot. Gesell.*, 51 (1933), No. 9, pp. 386-392, figs. 5).—Using lanolin as a carrier for the growth substance, a paste was obtained superior to agar in duration of effectiveness and in resistance to drying. The results of initial tests are presented.

The water relations of the plant cell, E. C. M. ERNEST (*Jour. Linn. Soc. London, Bot.*, 49 (1934), No. 330, pp. 495-502, figs. 2).—Different technics used to determine suction pressure values in plant tissues are discussed. Tests showed extremely slight variations in such values for each of 2 species of plants when determined at 2-hr. intervals through a 24-hr. period, or when determined in different leaves from different plants of 1 species.

The author concludes that "variations in the osmotic pressure of the cell probably result more nearly from differences in internal structure and from varied processes of metabolism than from environmental factors."

The absorption and accumulation of solutes by living plant cells.—VI, The absorption of potassium bromide from dilute solution by tissue from various plant storage organs, W. E. BERRY and F. C. STEWARD (*Ann. Bot. [London]*, 48 (1934), No. 190, pp. 395-410, fig. 1).—Storage tissue disks (of potato, carrot, artichoke, etc.) containing cells capable of renewed growth accumulated the bromide ion. Tissues (of apple and pear fruits) incapable of such regeneration failed to do so. The former showed protoplasmic streaming. Respiration rates were also studied.

The composition, quantity, and physiological significance of gases in tree stems, W. W. CHASE (*Minnesota Sta. Tech. Bul.* 99 (1934), pp. 51, figs. 12).—The results are given of a study of the composition of gases drawn at frequent intervals throughout the year from the trunks of the American elm (*Ulmus americana*), red oak (*Quercus borealis*), bur oak (*Q. macrocarpa*), cottonwood (*Populus deltoides virginiana*), and white pine (*Pinus strobus*) growing under Minnesota conditions. The percentage of CO₂ was found to be highest during the growing season, to fluctuate during autumn and spring, and to be lowest in winter. The percentage of O₂ was lowest in summer and highest in winter, and varied inversely with the percentage of CO₂ throughout the year. The sum of CO₂ and O₂ was less than the total of these gases in the atmosphere. This relationship was less pronounced during the dormant season. The percentage of CO₂ was very low during the growing season for the angiospermous species which produce narrow annual rings, and higher for those which grow more rapidly. Gases drawn from the outer rings of the sapwood were lower in CO₂ and higher in O₂ than those drawn from the heartwood. There was no apparent relationship between the percentage of CO₂ and O₂ at different heights above the ground.

Recent studies on the direction of movement of assimilates in the plant stem [trans. title], K. SILBERSCHMIDT (*Naturwissenschaften*, 22 (1934), No. 43, pp. 725-728).—This is a critical review of recent contributions.

Anomalous secondary thickening in Compositae, R. S. ADAMSON (*Ann. Bot. [London]*, 48 (1934), No. 190, pp. 505-514, figs. 7).—Anomalous secondary growth was found to occur in seven genera of the Inuleae. In the stem the primary bundles were without cambium. A pericyclic cambium adds internally strands of xylem and phloem with ground tissue. In the root secondary growth differed in different genera.

The plasmodesms in the leaves and stems of some angiosperms, J. N. MARTIN (*Iowa State Col. Jour. Sci.*, 8 (1934), No. 3, pp. 449-459, pl. 1).—Fresh

sections from the stems and leaves of potato, tomato, pepper, eggplant, nasturtium, watermelon, cucumber, field pumpkin, squash, onion, lily, corn, aster, apple, hickory, and white oak were treated successively with iodine, sulfuric acid, and pyocanin. Single or multiple strand plasmodesms, often in numbers, were found between adjacent living cells in all plants studied, as illustrated by photomicrographs.

Perforated fiber-tracheids in the passion flowers, R. H. WOODWORTH (*Science*, 80 (1934), No. 2081, pp. 449, 450).—The perforations in the walls of fiber-tracheids found in all eight species of *Passiflora* studied constituted unobstructed passages from one fiber-tracheid to another, but never, apparently, to a vessel element, nor to a ray cell.

Investigations on spontaneous contraction of vacuoles [trans. title], J. HENNER (*Protoplasma*, 21 (1934), No. 1, pp. 81–111, figs. 10).—This study was conducted on the large vacuoles of living cells from various higher plants, including the epidermal cells of onion bulb scales. The results are described in detail. Spontaneous contraction was commonly, but not always, observable.

Studies on the transport of nitrogenous substances in the cotton plant.—**VI, Concerning storage in the bark, T. G. MASON and E. PHILLIS** (*Ann. Bot.* [London], 48 (1934), No. 190, pp. 315–333, figs. 7).—With curtailed N supply apical growth is retarded. The N travels from mature leaves to young vegetative parts, and with flowering and boll formation is withdrawn from the vegetative parts. There was inferred to be more storage N in the bark of the lower part of the stem than above. Ca is not withdrawn from the vegetative parts at bolling and is held, therefore, not to be in movement in the phloem normally. The N gradients in the bark were negative whether N was limiting or in excess, and it is inferred that the storage of N in the bark is unaffected by the supply.

Influence of potassium nitrate on nodule formation and nitrogen fixation by clover, E. W. HOPKINS, P. W. WILSON, and W. H. PETERSON (*Plant Physiol.*, 7 (1932), No. 4, pp. 597–611).—In this contribution from the Wisconsin Experiment Station, it is reported that clover plants were grown aseptically in bottles on agar containing nutrient, to some of which varying concentrations of KNO_3 were added, either before sterilization or at various intervals, for varying periods. A strain of *Rhizobium trifolii* was used for inoculation. Nitrate additions always resulted in the formation of mostly round nodules scattered on the secondary roots instead of elongated ones on the taproot near the crown, as in the checks. Nodule size decreased as nitrate quantity increased, and nodule numbers were usually, but not invariably, reduced when nitrate N exceeded 20–30 p. p. m. All concentrations decreased the fixation of free N, and an excess completely suppressed it even though nodules were present.

A statistical study of nitrogen fixation by clover plants, P. W. WILSON, P. WENCK, and W. H. PETERSON (*Soil Sci.*, 35 (1933), No. 2, pp. 123–143, figs. 2).—In this contribution from the Wisconsin Experiment Station, inoculated clover plants were grown on agar in cotton-plugged bottles and on sand in open jars in the greenhouse. Measurements were taken on the milligrams of nitrogen fixed; the number, type, and location of the nodules; the length of the stems and roots; and on the number of leaves. The data were subjected to statistical analysis, the results of which are given. Under the conditions, the populations sampled were homogeneous with but a single exception. The simple correlation coefficients indicated that no two of the variables measured were very highly correlated with each other.

Flora of the U. S. S. R., I, II, edited by V. A. KOMAROV ET AL. (*Flora S. S. S. R., I, II. Leningrad: Akad. Nauk S. S. S. R., 1934, vols. 1, pp. XVI+*

302, pls. [16]; 2, pp. XXXIII+778, pls. [51]).—In volume 1 keys and descriptions (in Russian) are given of 164 species of the Pteridophyta and 67 species of the Gymnospermae, and in the Monocotyledoneae 21 species of the Pandanales and 81 species of the Naiadales (Helobiae).

In volume 2 keys and descriptions (in Russian) are given of nearly 1,000 species belonging to the Gramineae. Line drawings illustrate the diagnostic characteristics. Latin descriptions of 87 new species are appended. The editor was assisted by other specialists.

Mycological explorations of Venezuela, C. E. CHARDON and R. A. TORO (*Puerto Rico Univ. Monog., Phys. and Biol. Sci., Ser. B, No. 2 (1934), pp. 353, pls. 34*).—This contribution from the University of Puerto Rico summarizes existing knowledge relating to the fungi of Venezuela and lists, with pertinent data, the species gathered on several collecting trips made during the period from 1930 to 1933. Ninety-two new species are described with Latin diagnosis. Eleven well-known North American mycologists collaborated with the authors by handling particular groups of fungi. There is an account of the present mycological explorations and a description of the physiography and life zones in the Andes of Venezuela.

A host index and an index of the genera of the included fungi are appended, and a bibliography of the literature dealing with Venezuelan fungi is given.

The Aspergilli of the section "niger" Thom and Church [trans. title]. R. MOSSERAY (*Cellule, 43 (1934), No. 2, pp. 201-286, pls. 4*).—Thirty-five forms or races distinguished by rather constant cultural characteristics (after over 100 transfers on Raulin agar) were obtained from a collection of 63 cultures and studied on a variety of media. The races which differed clearly from each other, especially in morphological characters, are considered autonomous species and are given separate descriptions, accompanied, in the case of new species, by Latin diagnoses. The species of C. Thom and M. [B.] Church have been retained, with slight modification, but a number of new species have been formed at the expense of *Aspergillus niger*. Colored reproductions illustrate the agar slant appearance of old and young cultures of 24 races. Line drawings depict conidiophores and conidia.

Variation in single spore cultures of *Aspergillus fischeri*, H. C. GREENE (*Mycologia, 25 (1933), No. 2, pp. 117-138, figs. 5*).—This contribution from the Wisconsin Experiment Station is based on a study of 448 single-spore cultures from ascospores and conidia, and shows variations in the degree to which parental characteristics are fixed in the offspring.

The relation of microorganisms to carotenoids and vitamin A.—I, The occurrence of carotene in bacteria, M. A. INGRAHAM and C. A. BAUMANN (*Jour. Bact., 28 (1934), No. 1, pp. 31-40, fig. 1*).—The fat-soluble pigments of various bacterial species were examined, and carotene was found to be rather widely distributed among the aerobic types only, particularly those containing orange, but not lemon yellow, coloring matter. Carotene synthesis was observed on synthetic media.—(*Courtesy Biol. Abs.*)

International rules of botanical nomenclature adopted by the Fifth International Botanical Congress, Cambridge, 1930, compiled by A. B. RENDLE (*Jour. Bot. [London], 72 (1934), No. 858, Sup., pp. 29*).—This is an abridged draft, in English, of the rules prepared with the approval of [H.] Harms.

GENETICS

Significance determination numbers: Numbers of individuals required at definite odds to secure statistical soundness in experimental trials, S. BIRD and H. S. GUTTERIDGE (*Sci. Agr., 14 (1934), No. 10, pp. 547-549; Fr. abs.,*

p. 549).—A table is presented to indicate the numbers of individuals necessary to show differences with odds of 19 to 1 when the percentage differences between the means vary from 1 to 20 and the coefficients of variability in the 2 groups from 4 to 35.

Plant breeding in the Soviet Union (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 13 (1933), pp. 58*).—This publication includes a review of the achievements of the U. S. S. R. Institute of Plant Industry in assembling and studying plant material for breeding, improvement of methods, new varieties, technological studies with cereals and fibers, improvement of quality, and plant physiology; the organization of research under the institute and plant breeding centers; and an address by N. I. Vavilov on the general principles of genetic investigation, with an outline of the program of research in general plant genetics and the specific genetics of cereal, forage, sugar, fiber, oil, and medicinal plants, vegetables, fruits, and forest and ornamental trees, to proceed during the second Five Year Plan (1933–37).

Cytogenetic notes on cotton and cotton relatives, J. M. WEBBER (*Science, 80 (1934), No. 2073, pp. 268, 269*).—In F_1 of interspecific hybrids of *Gossypium* made by the author and not previously reported, the chromosome complement at the reduction division is composed of (a) 13 pairs and 13 single chromosomes in hybrids between cultivated American and wild American species, (b) from 0 to 4 pairs with from 21 to 39 single chromosomes in hybrids between cultivated American species and *G. sturtii*, and (c) 26 single chromosomes in hybrids between wild American species and *G. sturtii*. Hybrids between *Thurberia thespesioides* and *G. sturtii* have been found to exhibit 26 single chromosomes at first metaphase. These new findings are held to indicate that the cultivated American cottons are of allopolyploid rather than autopolyploid nature. See also another contribution (E. S. R., 72, p. 31).

The cytogenetics of fourteen types derived from a single X-rayed sex cell of *Nicotiana tabacum*, T. H. GOODSPEED and P. AVERY (*Jour. Genet., 29 (1934), No. 3, pp. 327–353, pls. 6, figs. 12*).—Seven pure-breeding derivative types and seven other types not as yet established in a pure-breeding condition, obtained at the University of California from the progeny of a single X-rayed female gamete of *N. tabacum*, differed from one another and from the control in habit, form of leaf, flower and capsule, and in color of leaf and flower. At least 5 of the 24 chromosomes of the haploid set of *N. tabacum* have been altered. In the production of the 14 types, transgenations, homozygous deficiencies, duplications, and presumably translocations were involved.

Derivative types obtained by backcrossing *Nicotiana rustica-paniculata* to *N. paniculata*, W. E. LAMMERTS (*Jour. Genet., 29 (1934), No. 3, pp. 355–366, pls. 3*).—The continuous backcrossing of the *N. rustica* (24_{II})-*paniculata* (12_{II}) hybrid to *N. paniculata* at the University of California resulted in a series of true breeding derivative types (12_{II}) quite distinct from *N. paniculata* but behaving as Mendelian units when crossed to it. Twelve types so far analyzed proved to be simple recessives, two of them being allelomorphic. One very distinctive derivative with a spurred corolla was shown to be due to the interaction of four recessive factors. Characters differentiating these types from *N. paniculata* were not present as visible character contrasts in the two parental species. An explanation of these recessive derivative types is offered.

A haploid plant in rice, K. RAMIAH, N. PARTHASARATHI, and S. RAMANUJAM (*Jour. Indian Bot. Soc., 13 (1934), No. 2, pp. 153–164, pl. 1, figs. 5*).—The sterile haploid associated with a diploid from a polyembryonic seed of a pure culture in rice was characterized by later blooming than normal, absence of anthesis, slightly reduced vegetative parts, and floral organs about half as large as in the diploid. Features of meiosis from diakinesis to tetrad-formation are de-

scribed, with remarks on its origin suggesting that it may be due to development of a reduced cell in the embryo sac other than the egg cell.

Inheritance of awn development in sorghums, J. B. SIEGLINGER, A. F. SWANSON, and J. H. MARTIN (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 7, pp. 663-668, fig. 1).—Sorghum varieties are grouped on the basis of awn development into the classes strong-awned, tip-awned, weak-awned, and awnless. Studies of the behavior in nine crosses between varieties of the strong-awned, tip-awned, and awnless classes furnished data indicating that the awnless character is inherited as a simple dominant to both the strong-awn and tip-awn characters. The strong-awn character is inherited as a simple but partial dominant to the tip-awn character. Inheritance of awn development seemed to be explained best by the assumption of three pairs of multiple allelomorphous factors, namely, *AA* (awnless), *aa* (strong awn), and *a⁺a⁺* (tip awn).

Pale—an hereditary chlorophyll deficiency in beans, F. L. SMITH (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 893-897).—A pale mutant bean found in a selection of a white-seeded family of Robust × Pink at the University of California had lighter colored leaves than the normal type and yielded about one-fourth as much as Robust, although there was no mortality in germination. The *F*₁, *F*₂, and *F*₃ behavior of Robust × Pale and the reciprocal suggested that the pale condition is controlled by a single recessive gene *pa*, which has the normal allelomorph *Pa* in the Robust variety.

Two types of genetic control over the development of shape, E. W. SINNOTT and S. KAISER (*Bul. Torrey Bot. Club*, 61 (1934), No. 1, pp. 1-7, figs. 2).—Observations on the developmental stages of young fruits of pure lines of *Cucurbita* and *Capsicum* from the youngest observable ovary primordia to the mature fruit showed that varietal shape is distinguishable in the earliest primordia in *Cucurbita*, but not until about the time of fertilization in *Capsicum*. Thus the stage at which the genes for fruit shape exert a visible effect differs markedly in the two distinct genera.

Metaxenia and xenia in apples, IV, B. R. NEBEL and Z. I. KERTESZ (*Gartenbauwissenschaft*, 9 (1934), No. 1, pp. 45-64, fig. 1).—Continued studies (E. S. R., 68, p. 747) at the New York State Experiment Station pointed to the fact that metaxenia occurs rather freely in the apple and may be shown in several different characteristics, notably size and uniformity of fruits, acidity, pH, and color of the expressed juice and loss of weight in storage. As compared with Red Astrachan, *Malus atrosanguinea*, and *M. baccata*, Yellow Bellflower pollen exhibited a marked tendency to produce a less uniform crop of McIntosh apples. Although McIntosh × Red Astrachan and McIntosh × *M. baccata* apples resembled each other closely in seed number, size, and standard deviation, they differed significantly in sugar contents. On the other hand Red Astrachan and *M. atrosanguinea* groups differing decidedly in seed number, etc., were practically alike in sugar content. The juice of McIntosh apples produced with *M. baccata* pollen was distinctly darker in color. What is believed to be true xenia was observed in the McIntosh × Yellow Bellflower cross, where seed length and variability in seed length were increased.

Chromosome behavior in *Pinus banksiana* following fertilization, J. M. BEAL (*Bot. Gaz.*, 95 (1934), No. 4, pp. 660-666, pls. 2).—A descriptive account is presented of the chromosomal behavior in the first and second embryonal divisions.

Animal breeding in the British Empire: A survey of research and experiment, F. F. DARLING (*Edinburgh: Imp. Bur. Anim. Genet.*, 1934, pp. 47).—A summary of livestock breeding in Great Britain and the British Colonies, with special reference to the purpose for which the livestock is bred and the different customs and conditions in the Colonies.

Twinning in cattle, A. C. T. HEWITT (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 8, pp. 386-390, figs. 8).—In 1,260 Red Poll births and 200 Friesian births at the Victoria Department of Agriculture, 26 and 6, respectively, were twins. The birth weights of twins were only slightly smaller than singles, and the percentages reached did not differ greatly. The production of twins was especially outstanding in 2 Red Poll families. Likelihood of twinning increased with the age of the dam but was not related to season. The twins and dams of twins were better producers of milk and butterfat than the rest of the herd in both breeds.

Animal genetics (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1934, pp. 3, 4).—The results of investigations on inbreeding and crossing guinea pigs and Chester White and Tamworth swine and fertility and inheritance of cryptorchidism in boars are briefly reported.

White spotting in Duroc-Jersey swine, J. E. NORDBY (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 7, pp. 625-634, figs. 5).—Studies at the Idaho Experiment Station indicated that the occurrence of white on the feet and legs, tip of the tail, in the forehead, and in the form of complete and also incomplete belts over the shoulder and rump in Duroc-Jerseys, a self-red breed of swine, is increased by inbreeding. The color defects have, no doubt, been inherited from early Asiatic and European breeds whose influence was effective in the early history of the Duroc-Jersey. The inheritance of the white is not due to a simple recessive gene. Nongenetic factors apparently influence the pattern and the amount of white.

A new gene affecting behavior and skeleton in the house mouse, L. C. DUNN (*Natl. Acad. Sci. Proc.*, 20 (1934), No. 4, pp. 230-232).—A mutation in the house mouse, recessive to normal, in which tail length was shortened and equilibration and nervous coordination were affected, including certain other symptoms, is described. Homozygous mice were sterile.

Anatomical basis of hereditary hydrocephalus in the house mouse, F. H. CLARK (*Anat. Rec.*, 58 (1934), No. 3, pp. 225-233, pl. 1).—An anatomical study of a mutant hereditary hydrocephalus condition in the house mouse is reported.

Physiological research at the Beltsville laboratory (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt.*, 1934, pp. 11, 12).—Results of studies of the time of ovulation in the cow, the influence of the pituitary hormones on milk production in cows, and virility in bulls are noted.

Individuality of the blood in higher animals, A. S. WIENER (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 66 (1933), No. 1, pp. 31-48).—The differences between the types of blood of man, cattle, and poultry are briefly reviewed, with special consideration of the agglutinogens present in the blood of different families of fowl described by Todd.³

Individuality of the blood in higher animals.—II, Agglutinogens in red blood cells of fowls, A. S. WIENER (*Jour. Genet.*, 29 (1934), No. 1, pp. 1-8).—An analysis of Todd's data, noted above, on the serological reactions of three large families of chickens suggests that a relatively small number of different sharply-defined agglutinogens were present and that all were inherited as simple Mendelian dominants.

The thermo-regulatory function and mechanism of the scrotum, R. W. PHILLIPS and F. F. MCKENZIE (*Missouri Sta. Res. Bul.* 217 (1934), pp. 73, figs. 31).—A study of the thermo-regulatory mechanism of the scrotum and its influence on spermatogenesis is reported, based on experiments with 18 rats, 12 guinea pigs, and 21 rams.

³ Roy. Soc. [London], Proc., Ser. B, 107 (1930), No. B 750, pp. 197-205.

Data are given on the temperature in the scrotum and testes of the rams with and without scrotal insulation in comparison with the body temperatures. Studies of the influence of scrotal insulation on the histology of the testicle and the characteristics of the spermatozoa for from 4 days to 16 weeks showed that degeneration of the germinal epithelium set in early with sloughing and an edematous condition following and subsequent shrinkage of the tubules. Spermatozoa exhibiting various types of abnormalities were found in the semen after insulation, but the time elapsing before their appearance indicated that they result from the effects of the heat on the developing sperm rather than from changes in the fully formed sperm.

Studies of the tunica dartos muscle intact in the scrotum and isolated in strips showed that it relaxes with temperature increases and contracts with temperature decreases and thus causes the scrotum to function as a heat regulator.

The influence of ephedrine, adrenalin, and pilocarpine on the dartos muscle of rams was also studied.

Two rams in a high condition and with a heavy covering of wool over the scrotum were observed which were unable to continue normal spermatogenesis. After treatment to lower the condition and shearing, normal fertility was restored.

Degeneration of the germinal tissue followed the introduction of guinea pig testes into the abdomen, but no noticeable damage resulted from lowering the temperature of rat testes for from 30 min. to 2 hr. by suspending them in Ringer's solution at from 17° to 19° C. or by the external application of cold water.

[Hormone control and development of the mammary gland], C. W. TURNER, A. B. SCHULTZE, W. R. DEMOSS, W. H. REMMERT, E. T. GOMEZ, and W. U. GARDNER (*Missouri Sta. Bul.* 340 (1934), pp. 37-39).—The results of further studies of the development of the mammary gland and the role of the sex hormones (E. S. R., 71, p. 459; 72, p. 33) are presented.

Effect of combination of two antagonistic anterior pituitary hormones on sex organs of guinea pig, H. M. AFF and L. LOEB (*Soc. Expt. Biol. and Med. Proc.*, 31 (1934), No. 8, pp. 957-961).—Studies of the effect of two antagonistic hormones of the anterior pituitary gland, alone or in combination in guinea pigs with and without subsequent implantations of rabbit, rat, or guinea pig anterior pituitary glands, were made as to their influence on the development of the ovaries, uterus, vagina, cervix, and mammary glands and compared with the effects of underfeeding in these animals.

The hormone causing atresia of the follicles prevented the full effect of the hormone causing growth and maturation of the follicles administered subsequently, and the inhibiting effect was similar to that produced by underfeeding.

The hormone causing follicular atresia induced indirectly a state of rest in the vagina, uterus, and mammary gland; and the hormone causing follicular growth induced proliferation in these organs and the estrous condition of the animal.

Experiments on developing rats.—I, Limits of foetal regeneration; behavior of embryonic material in abnormal environments, J. S. NICHOLAS (*Anat. Rec.*, 58 (1934), No. 4, pp. 387-413, pls. 2, figs. 6).—Data are reported on experiments in which rat fetuses were operated on by amputation of the limbs and transplantation of the limbs and other organs to various sites, including glandular tissues, for development.

[Studies of the physiology of reproduction in sheep] (*Missouri Sta. Bul.* 340 (1934), pp. 10-13, figs. 2).—Results are briefly reported from observa-

tions on ewes at the time of parturition, by F. F. McKenzie and R. Bogart, as to the temperature of the ewes, character of filling the udder and teats, breaking of the cord, behavior of lambs immediately after birth, and character of the afterbirth of the ewes before and after parturition; as to histological changes in the genital tract of the ewe, by McKenzie and C. E. Terrill, in which observations were made on slaughtered animals at different stages of the estrous cycle; as to studies of the cytology of the corpora lutea of the ewe at different stages of the estrous cycle, by M. J. Guthrie and V. Warbritton; as to differences in the cytology of the pituitary glands from pregnant and nonpregnant ewes, by McKenzie and L. J. Nahm; and as to changes occurring in the histology of the adrenal glands during the estrous cycle in nine nonpregnant ewes, by McKenzie and Nahm.

The use of pregnancy urine and prolan in animal industry, E. P. TCHERNOZATONSKAIA (*Endocrinology*, 18 (1934), No. 4, pp. 482-486).—The results of experiments dealing with the influence of prolan and gravidan (sterilized pregnancy urine) on increases in live weight and composition of the flesh of from 6- to 8-month-old rabbits are reported. Treatments were given in different groups every other day or every fifth day. The results showed that the weight increase in 1½ mo. in the controls receiving a physiological salt solution was from 2 to 5 percent, whereas increases in weight in those treated with prolan were from 12 to 23 percent, with gravidan from 6 to 19 percent, and with normal urine from 8 to 11 percent. The dressing percentages and fat in the flesh were also higher in the gravidan- and prolan-treated animals.

Can pregnancy in sheep and goats be established by urinary investigations? [trans. title] W. MAURER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol.*, 29 (1934), No. 1, pp. 133-135).—Injections of urine and ether extracts of urine from 6 pregnant sheep and 4 pregnant goats into infantile mice gave negative results for the pregnancy test, suggesting that this method cannot be used for diagnosing pregnancy in these animals.

The effect of intravenous administration of the pregnancy urine factor on the ovaries of rhesus monkeys, E. T. ENGLE (*Amer. Jour. Physiol.*, 108 (1934), No. 3, pp. 528-534, fig. 1).—The intravenous administration of the anterior pituitary-like principle of pregnancy urine to monkeys in doses varying from 3,000 to 9,900 rat units failed to cause estrin production. However, it did not cause damage to the ovaries, which could be reactivated with the active fraction of the anterior pituitary.

Differential ovarian responses after injections of follicle-stimulating and pregnancy urine in very young female rats, P. E. SMITH, E. T. ENGLE, and H. H. TYNDALE (*Soc. Expt. Biol. and Med. Proc.*, 31 (1934), No. 6, p. 744).—The failure of injections of pregnancy urine extracts to cause thecal hypertrophy after 10 injections into females from the sixth to the eleventh day of age suggests that the gamete and granulosa must undergo some maturation change before they are capable of responding to the follicle-stimulating hormone.

Production of pseudo-pregnancy by mechanical stimulation of the nipples, H. SELYE and T. McKEOWN (*Soc. Expt. Biol. and Med. Proc.*, 31 (1934), No. 6, pp. 683-687, figs. 4).—A condition resembling pseudopregnancy was induced in several groups of nonpregnant rats by stimulation of the nipples resulting from suckling. The groups included adult virgin rats, females whose litters had been weaned at the end of a normal lactation, and lactating dams deprived of their litters.

Observations on the treatment of infertile rabbits with antuitrin "S", P. D. ROSAHN, H. S. N. GREENE, and C. K. HU (*Soc. Expt. Biol. and Med. Proc.*,

31 (1934), No. 8, pp. 1008-1010).—Twenty-seven rabbits failing to produce young regularly were treated with a single dose of 40 rat units per kilogram of body weight of antuitrin S and mated at intervals ranging from 22 hours before to 24 hours after the administration of the hormone. Six deaths occurred, but in 37 trials with 23 animals there were 9 pregnancies and 28 infertile matings as compared with 9 pregnancies after 122 matings of these 23 animals prior to the treatment.

It is considered that the sterility in these animals was due to the failure of ovulation after coitus, and that the additional stimulation from the pregnancy urine extract at the time of mating resulted in ovulation in the greater number of the cases.

Artificially induced ovulation in the cat (*Felis domestica*), W. W. GREULICH (*Anat. Rec.*, 58 (1934), No. 3, pp. 217-224).—Ovulation was induced in 9 of 12 cats tested by artificial stimulation of the distal portion of the genital tract when the cats were in heat. Other evidence is presented to indicate that ovulation does not always accompany coitus in the cat.

Ovulation in the domestic hen, D. C. WARREN and H. M. SCOTT (*Science*, 80 (1934), No. 2081, pp. 461, 462).—Careful observation was made at the Kansas Experiment Station of ovulation in the hen under anesthesia. In 11 birds in which ovulation occurred under observation it was evident that it was not necessary for the egg to be ovulated directly into the infundibulum, and it was possible for the infundibulum to pick up the ovum after it was released into the cavity about the ovary. There was no case in which the infundibulum appeared to exert pressure upon the follicle previous to ovulation. Ovulation was found to occur within an hour after laying and the changes in the ovary and reproductive system were observed. By marking the position of the egg at 15 minute intervals in its passage down the oviduct, it was found that the following time was spent in the various parts of the oviduct: Infundibulum, 18 min.; albumin secreting section, 2 hr. 54 min.; isthmus, 1 hr. 14 min.; uterus and vagina, 20 hr. 40 min.

FIELD CROPS

[Field crops experiments in Missouri], A. C. RAGSDALE, C. W. MCINTYRE, J. R. DAWSON, W. C. ETHERIDGE, E. M. BROWN, B. M. KING, L. J. STADLER, and R. T. KIRKPATRICK (*Missouri Sta. Bul.* 340 (1934), pp. 44, 45, 52-58, fig. 1).—The progress of breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; studies of the genetic and cytological effects of irradiation of corn and comparisons of mutations induced by irradiation and spontaneous mutations in corn; variety tests with corn, wheat, barley, oats, soybeans, and cotton; a variety-date-of-seeding test with wheat in regard to Hessian fly; and comparisons of grazing systems and fertilizer tests with pasture are reviewed as heretofore (*E. S. R.*, 70, p. 172).

[Field crops research in Wisconsin, 1932-33] (*Wisconsin Sta. Bul.* 428 (1934), pp. 65-70, 71, 72, 78-81, figs. 2).—Progress is again (*E. S. R.*, 69, p. 791) reported on studies of the response of bluegrass pasture to rotational grazing, irrigation, and fertilizer, especially nitrogen, and determination of the chemical form of the nitrogen in the grass from the several treatments, by G. B. Mortimer, H. L. Ahlgren, and E. J. Graul; grazing experiments with heifers on nitrogen-fertilized rotated bluegrass pasture, by Mortimer and I. W. Rupel; permanent pasture studies in southwestern Wisconsin involving comparisons of mineral and nitrogen treatments, resting the land without fertilizing, the movement of phosphate and lime top-dressed on pasture into the soil, and the availability of phosphorus as affected by soil reaction; control of crab-

grass in lawns by cutting, nitrogen fertilization, and watering; and relation between yield and color of corn (E. S. R., 71, p. 766), by R. A. Brink. Work in cooperation with the U. S. Department of Agriculture included production of selected hybrid strains of corn, by Brink, J. G. Dickson, B. D. Leith, A. H. Wright, and N. P. Neal; production of smut and rust resistant oats hybrids, by Dickson, Leith, and H. L. Shands; and development of a superior strain (No. 236) of Havana tobacco resistant to black root rot, by J. Johnson and F. S. Henika, and fertilizer tests with tobacco, by Johnson and W. B. Ogden.

The Gramineae: A study of cereal, bamboo, and grass, A. ARBER (*Cambridge, Eng.: Univ. Press, 1934, pp. XVII+480, pl. 1, figs. 212*).—The scope of this book is indicated by the topics considered in its successive chapters, including cereals of the Old and New Worlds; pasture grasses, sugarcane, and oil grasses; the vegetative phase, tree habit, reproductive phase, and spikelet and fruit of bamboo; the reproductive shoot—structure, anthesis, compression, and sterilization—in grasses; individuality and life phases; embryos and seedlings; vegetative phase—root, shoot, and leaf; the Gramineae and the study of morphological categories; distribution and dispersal of grasses; corn and *Spartina townsendii* as putative hybrids; and pattern and rhythm in the Gramineae. Much information is included on the agricultural history and uses of grasses. A taxonomic table, an extensive bibliography, and an index are appended.

Effect of frequent cutting and nitrate fertilization on the growth behavior and relative composition of pasture grasses, W. A. LEUKEL, J. P. CAMP, and J. M. COLEMAN (*Florida Sta. Bul. 269 (1934), pp. 48, figs. 14*).—The growth behavior, yield, and relative composition of Bahia grass, carpet grass, centipede grass, and Sudan grass were studied when subjected to sodium nitrate fertilization, watering, and cutting treatments. Particular attention was paid to the response of plants cut frequently as compared with plants grown to maturity. See also an earlier note (E. S. R., 64, p. 218).

Plants cut frequently maintained a more vegetative growth condition and greater horizontal growth of stolons, resulting in better sod formation. They responded in yield of green and dry top growth to sodium nitrate and water, sodium nitrate, water, and no treatment, in order, and with greater yields to an increase in nitrate fertilization. The top growth of such plants showed a more uniform trend in dry-matter percentage, varied inversely in dry-matter percentage with the rate of nitrate fertilization, contained higher percentages of ether-extracted substances, fluctuated in total hydrolyzable carbohydrates with a lower and more uniform hydrolyzable residue, and contained higher percentages of nitrogen from one cutting period to another. Plants cut often responded to nitrate fertilization by more vegetative growth and a higher nitrogen percentage, had higher and more uniform mineral compounds of phosphorus and potassium in top growth throughout the growing season, and showed narrow relations in top growth between total nitrogen and total hydrolyzable carbohydrates and unhydrolyzed residue and between carbohydrate compounds and compounds of phosphorus and potassium, these narrow relations being associated with vegetative growth.

Plants grown to maturity were vegetative during the early growth period, but soon entered a reproductive growth stage, ceasing vegetative extension. They produced an upright growth of stolons when reproductive and formed a poor sod. Such plants responded most to sodium nitrate and then to sodium nitrate and water in yields of green and dry top growth. Their top growth gradually increased in dry matter as maturity approached, and with nitrate fertilization contained a low percentage of dry matter in early growth which gradually increased toward maturity. The top growth of such plants was lower in ether-extracted substances, rather uniform in total hydrolyzable

carbohydrates throughout the growing season, higher in unhydrolyzed residue which rose gradually toward maturity, and decreased gradually in nitrogen content toward the seed stage. When plants were treated with nitrates the top growth had a higher percentage of nitrogen in early growth, decreasing to the level of untreated plants in later growth stages. The top growth of plants grown to maturity showed gradual decreases in the percentages of mineral compounds of phosphorus and potassium toward maturity, and gradually widening ratios of total nitrogen, phosphorus, and potassium to total hydrolyzable carbohydrates and unhydrolyzed residues as the plants approached the later growth stages, a condition associated with reproduction and seed formation in the top growth.

Increase in nitrate fertilization caused no marked accumulation of nitrates in the top growth of pasture plants, it being reflected in increased production of vegetative top growth. Sudan grass produced increased vegetative top growth high in nitrogen over a short period as a result of frequent cutting and nitrate fertilization, although this grass, due to its upright growth, was killed out by frequent cutting. Practical applications of the results are suggested.

Further evidence upon the nitrogen uptake of grass grown with lucerne. H. G. THORNTON and H. NICOL (*Jour. Agr. Sci. [England]*, 24 (1934) No. 4, pp. 540-543, fig. 1).—In further studies (E. S. R., 71, p. 466) Italian ryegrass grown with alfalfa in sand without added nitrogen contained, after 18 weeks' growth, about 2.25 times as much nitrogen as did grass grown without alfalfa. When alfalfa and grass were grown together in sand and 0.33 g of sodium nitrate was added per pot, the grass after only 13.5 weeks' growth contained 2.5 times, and after 18 weeks, 5.5 times as much nitrogen as was supplied as nitrate. Where 1 g of nitrate was added, the grass after 13.5 weeks contained slightly more nitrogen than was added as nitrate, and after 18 weeks it contained 2.25 times as much, but where 3 g were supplied there was slightly less than a quantitative recovery in the grass of the nitrate nitrogen.

Some effects of clipping the tops upon the root development of lucerne (*Medicago sativa* L.). H. G. THORNTON and H. NICOL (*Jour. Agr. Sci. [England]*, 24 (1934), No. 4, pp. 532-539, fig. 1).—Inoculated alfalfa grown at the Rothamsted Experimental Station in pots of sand supplied with nitrogen-free nutrient solution was clipped once, twice, or unclipped, and was harvested on four dates at about 3-week intervals. Clipping did not alter significantly the nodule numbers, their mean size, or the total nitrogen contents of the plants, but resulted in a decrease in the nitrogen content of the roots of about 40 percent. This nitrogen evidently was transferred to the tops where it was removed in the clippings. In clipped plants the total yield of tops, including clippings, was increased slightly, but that of the roots was greatly depressed, resulting in a reduction in the total dry weight of the whole plants.

Birdsfoot trefoil in agriculture. D. H. ROBINSON (*Empire Jour. Expt. Agr.*, 2 (1934), No. 7, pp. 274-283).—This review of literature concerned with growing birdsfoot trefoil (*Lotus corniculatus*) for hay and seed is based on the author's exhaustive account of the anatomy, classification, and economic uses of the various species of birdsfoot trefoil (an unpublished thesis presented to the University of London).

Methods of reestablishing buffalo grass on cultivated land in the Great Plains. D. A. SAVAGE (*U. S. Dept. Agr. Circ.* 328 (1934), pp. 20, figs. 11).—The characteristics, adaptations, and uses of buffalo grass are described, and the progress of extensive resodding experiments made since 1929 at Hays, Kans., in cooperation with the Kansas Experiment Station, is reviewed. It is considered the only grass adapted to the Great Plains area that may be used successfully for pastures, sports fields, golf courses, lawns, and general landscaping purposes.

Establishment of buffalo grass by seeding is impractical, and, while it may be propagated by setting out the runners or stolons in moist soil, this method does not succeed on strictly dry land. Practices indicated by the research and experience include setting out 4-in. cubes of sod from 3 to 4 ft. apart, preferably in March or April before spring growth has started and following a heavy rain, packing the land after setting sods, clipping or grazing to control other growth and prevent shading, and avoiding cultivation and heavy watering after setting. An effective way of planting large areas is to slide pieces of sod in sheet iron chutes from wagons to the surface of deeply cultivated land and press them into the ground with a heavily weighted surface packer. For landscape purposes careful preliminary grading and setting the sods level with the surface and top-dressing with soil after the grass is established to level uneven surfaces are advised.

Response of inbred lines and crosses in maize to variations of nitrogen and phosphorus supplied as nutrients, S. N. SMITH (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 785-804, figs. 3).—The relative amount of growth made by 24 inbred lines and 23 single crosses of corn with various limitations of phosphorus and nitrogen was studied at the Iowa Experiment Station with plants growing in soil, sand and soil, river sand, quartz sand, and water cultures. The growth was measured in terms of dry weight of the plant produced at 6 weeks of age, with one test based on ear weights. Many inbred lines behaved similarly, although a few showed distinct differences on a limited phosphorus supply. Differential response to a low nitrogen supply was less evident.

Two inbred lines which thrived on low phosphorus and two which grew poorly were found to have a significantly differential response when grown on a medium low in phosphorus, while differences in nitrogen efficiency were not large. Study of the 6 crosses of these inbreds in the same tests with the parents revealed dominance of phosphate efficiency, particularly with one of the efficient parents, which was most evident on the first levels of phosphorus deficiency most apt to be encountered in soils. The cross of the phosphate inefficient inbred lines showed no evidence of physiologic stimulation as to more effective use of limited supplies of nitrogen and phosphorus. While phosphate efficiency was not definitely related to percentage composition of (total) phosphorus of inbred lines, efficient lines when starved showed a greater supply of inorganic phosphorus in the plant than did inefficient lines. A high ratio of secondary to primary roots found with the phosphate efficient lines and a low ratio with the inefficient ones appeared to be heritable and not subject to alteration by the growth medium. The 6 crosses of the 4 inbreds all showed increased ratio of secondary to primary roots above the average of the two parents. High ratio of secondary to primary roots appeared to be dominant in the F_1 generation.

Dominance of inheritance of branch root type is advanced as the probable cause of phosphate efficiency in the hybrids. Dominance of ability to absorb nutrients more rapidly, resulting from the branched root type, is considered to be one of the favorable growth factors causing hybrid vigor.

Korean lespedeza, C. A. MOOERS (*Tennessee Sta. Circ.* 49 (1934), pp. 2).—The origin, adaptation, and culture and fertility needs of Korean lespedeza are described briefly, with remarks on harvesting for hay and seed and on control of dodder.

Napier grass (*Pennisetum purpureum*), a pasture and green fodder crop for Hawaii, C. P. WILSIE and M. TAKAHASHI (*Hawaii Sta. Bul.* 72 (1934), pp. 17, figs. 5).—The characteristics and climatic, soil, and cultural needs of Napier grass and its use for soiling, fodder, and pasture are described, and

yield tests and analyses in comparison with Merker grass and other grasses are reported.

Napier or elephant grass, a tall vigorous perennial introduced into Hawaii in 1915 and important as a pasture and green fodder crop, is described as aggressive, heavy yielding, high in nutritive value, and persistent in growth over a period of years. It is best propagated by stalk cuttings or root-clump divisions. The grass, while drought resistant, responds to abundant moisture and can be grown successfully under irrigation. Yields of from 50 to 90 tons of green fodder per acre per year under favorable growing conditions, and a carrying capacity of one mature beef animal per acre per year for Napier grass pastures under proper management, are reported. This grass may be pastured successfully if rotational grazing is practiced.

The analyses showed that Napier grass resembles Sudan grass in protein and crude-fiber content when cut at the proper stage for green fodder, but has a considerably higher percentage of total ash. Merker grass, a strain of *P. purpureum* similar to Napier grass, seemed slightly less palatable, particularly in more mature growth stages, and less desirable for forage, although differing little in yield of dry weight per acre.

The determination of winter-hardiness in oats, K. MATHER and G. ANDERSON (*Jour. Agr. Sci. [England]*, 24 (1934), No. 4, pp. 627-635).—Behavior of oats varieties in artificial freezing tests agreed in general with results of field trials in England (1928-29 winter) and Sweden. Grey Winter had a fair winter survival and certain selections from Grey Winter×Argentine had good and fair survivals, whereas Abundance, Bountiful, and Marvelous were completely killed. Segregation, not simple, for winter hardiness was observed in the offspring of Grey Winter×Argentine.

Effect of seed treatments on yield of oats, R. W. LEUKEL and T. R. STANTON (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 851-857).—When smut-free seed of several oats varieties, untreated and treated with several fungicides, were compared in experiments by the U. S. Department of Agriculture cooperating with several State experiment stations, the results indicated that, on the whole, seed treatment of clean seed did not cause any consistently significant increase in yield.

Oat-breeding in Scotland, W. ROBB (*Empire Jour. Expt. Agr.*, 2 (1934), No. 7, pp. 251-257).—Objectives and methods of oats breeding work at the Scottish Plant Breeding Station are outlined, with characteristics of its new oats varieties, Elder (Castleton Potato×Beseler Prolific), Bell (Sandy×Leader), and Early Miller (Potato×Record).

Fertilizer placement studies with potatoes in 1933, B. E. BROWN and G. A. CUMINGS (*Amer. Potato Jour.*, 11 (1934), No. 10, pp. 265-273).—Results obtained with both single and double strength fertilizer mixtures in continued cooperative experiments (E. S. R., 71, p. 767) showed that as in 1931 and 1932, with an occasional exception, side placement of fertilizer for potatoes proved superior to underneath placement.

The minimum weight of a prime potato, G. V. C. HOUGHLAND (*Amer. Potato Jour.*, 11 (1934), No. 8, pp. 205, 206, fig. 1).—Analysis of individual measurements and weights of 20,405 tubers of the 1928-30 crops of Irish Cobblers grown in Aroostook County, Maine, indicated the minimum weight of a prime potato of this variety to be 61 g and the maximum weight of a second to be 60 g.

Forage sorghums in Texas, J. R. QUINBY, J. C. STEPHENS, R. E. KARPER, and D. L. JONES (*Texas Sta. Bul.* 496 (1934), pp. 51, figs. 7).—Varietal and cultural experiments made by the station and the U. S. Department of Agriculture, working separately and in cooperation at substations in different

sections of Texas for extended periods, are reviewed, with descriptions of varieties and discussion of the characteristics of sorghum forage and the merits of seed treatments. Grain sorghums were reported on earlier (E. S. R., 68, p. 325). Sorghums are the most important source of roughage from cultivated crops in Texas, furnishing the bulk of the hay, bundle forage, and silage, and also are used extensively for pasture.

Sumac, Honey, and Sourless are considered the best varieties for Texas, producing well at all substations. Certain new hybrid varieties also are promising. Recommended planting dates of sorgho for forage are late May and June for west Texas, April 15 to May 15 for central Texas, and late March and early April for the region south and west of San Antonio. The favorable planting period covers about 6 weeks in all areas of Texas except the northern Panhandle. Spacings of from 1 to 4 in. apart in the row are indicated for forage and of from 5 to 6 in. for seed production. A 2-in. stand may usually be expected from planting 5 lb. per acre in rows and 5- to 6-in. stands from 2 lb. per acre. From 1 to 2 bu. per acre is advised when sorgho is broadcasted for hay. Sorghum seed infected with smut or of unknown origin should be treated with copper carbonate or another seed disinfectant at the rate of from 2 to 3 oz. per bushel before planting.

Silage yields from row plantings of sorgho have averaged 9 tons per acre in western Texas and 13 tons in moister sections. The better forage varieties of grain sorghums produce from 2 to 4 tons per acre less than the sorgos. From 100 to 130 bundles of air-dry sorgho forage will weigh a ton versus about 170 bundles of the better forage varieties of grain sorghums. About 20 to 25 percent fewer field-cured bundles than air-dry bundles are needed to weigh a ton.

Use of paraffin for overwinter storage of sugar beets, H. L. KOHLS (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 846-851).—The effect of storage on the sucrose content in the sugar beet and the effect of dipping mother beets 1, 2, and 3 times into melted paraffin at 55°-60°, 70°-80°, and 95°-100° C. on the production of seed per plant of mother beets were studied at the Michigan Experiment Station in cooperation with the U. S. Department of Agriculture.

No material decrease was observed in the total sucrose content of mother beets dipped in paraffin and stored. A thick paraffin coating was more effective than a thin coating in preventing loss of moisture from mother beets, and paraffin applied at lower temperatures was more effective than that applied at a high temperature. The coating reduced respiration but did not cause deterioration of the beets. The percentage of beets producing seed and the average seed yield per plant rose as the thickness of the coating decreased when the paraffin was not removed from the suture before planting, except with beets dipped in paraffin kept at 95° to 100°. When the paraffin coating was removed from the suture at planting, significant increases occurred in the percentage of beets producing seed and the average seed yield per plant, and mother beets stored in paraffin gave as satisfactory seed yields as those stored in moist sand.

Sugarcane research in Florida, Georgia, and Louisiana, R. L. DAVIS (*Puerto Rico Sta. Agr. Notes No. 68* (1934), pp. 3).—Methods used in breeding and testing sugarcane seedlings, and testing for disease resistance and for sugar yield at the U. S. Department of Agriculture field stations at Canal Point, Fla., Houma, La., and Cairo, Ga., are described briefly.

Storage of mill cane, J. I. LAURITZEN and R. T. BALCH (*U. S. Dept. Agr., Tech. Bul. 449* (1934), pp. 30, figs. 7).—Storage studies with sugarcane made in the cane belt of Louisiana, 1930-33, dealt with the effect of sprinkling on the

composition of mill cane in small piles (1,500 to 1,800 lb.) of several varieties stored in the shade or open, and in large piles (7 to 260 tons) in the open, with attention also to prevailing weather conditions and temperatures in piled cane. The relationship between weight changes and deterioration in stripped and unstripped cane also was considered.

Sprinkling of cane in small piles prevented heavy losses of sucrose in all varieties which might result from inversion in storage of unsprinkled cane. The extent of such inversion in unsprinkled cane in the shade compared with that stored in the open depends on cloudiness and rainfall, wet weather tending to check inversion. Sprinkling also retarded inversion in piles of from 7 to 260 tons during 6 to 10 days' storage. Deterioration in the piles of cane appeared due primarily to inversion of sucrose. There was no significant change in acidity, pH, or organic nonsugars, nor any change indicating the action of micro-organisms in sprinkled or unsprinkled piles. Although sprinkling tended to lower the temperature of cane in the piles, its value is believed to depend on its effectiveness in maintaining the normal turgidity of the cane throughout storage. The temperature at the center of the larger piles, although lagging behind, tended to fluctuate with the air temperature, indicating no progressive accumulation of heat due to respiration and micro-organisms. The rapidity of deterioration decreased with the maturity of the cane. The inversion of sucrose appeared to be associated intimately with the loss of moisture and to increase as the cane dries out.

Co. 281 deteriorated less rapidly under all conditions of storage than the other varieties studied; P. O. J. 36-M and C. P. 807 appeared most susceptible; and C. P. 28/19, Co. 290, P. O. J. 213, and P. O. J. 234 seemed between the two extremes. Their exact relation to each other had not been accurately determined.

The results show that very little deterioration occurred in stored sugarcane kept thoroughly wet during storage, suggest the practicability of storing mill cane, if sprinkled, in the mill yard or at the derricks during fair weather for insuring more continuous operations during rainy periods which interfere with harvesting, and also indicate that shading stored cane, especially during dry weather, tends to protect further against deterioration.

The nature and interaction of genes differentiating habit of growth in a cross between varieties of *Triticum vulgare*, LER. POWERS (*Jour. Agr. Res.* [U. S.], 49 (1934), No. 7, pp. 573-605, fig. 1).—In the study reported in this contribution from the Washington and Minnesota Experiment Stations, the parents in the cross Hybrid 128 × Velvet Node were found to be differentiated by three major factor pairs for growth habit and earliness of maturity, and modifying factors for earliness were shown to be present. *AA*, *BB*, and *cc* were factors for spring habit of growth and their allelomorphs were factors for winter habit. *AA* was epistatic to *bb* and *CC* as regards habit of growth, *BB* to *aa* and *CC*, and *cc* to *aa* and *bb*. *AA*, a factor for early maturity, caused plants to ripen earlier than *aaBBcc*, which caused plants to be of medium early maturity. Genotypes *aaBBCC* and *aabbcc* caused plants to be late in ripening and *aabbCC* caused winter growth habit. *BB* was only partially epistatic to *CC* as regards earliness of maturity, and therefore the greater earliness of *aaBBcc* as compared to *aaBBCC* is not entirely a cumulative effect.

Both the genes for spring habit of growth and those for winter habit of growth, as evidenced by the results, can initiate physiological reactions, and the end result or character depends upon the balance between these reactions. Genotypes giving a continuous range for earliness and lateness from the early ripening of the spring parent to the winter parent in which only a few of the

plants headed could be obtained. This is held to support the hypothesis that growth habit is a phase of earliness and lateness, and, therefore, that the genes differentiating habit of growth are rate factors in development. A theory for the evolution of multiple factors from a series of multiple allelomorphs and of epistasis which explains interactions between factors involved in this study is advanced.

The relation between yield and protein content of wheat, J. G. MALLOCH and R. NEWTON (*Canad. Jour. Res.*, 10 (1934), No. 6, pp. 774-779).—The negative correlation found between yield and protein content at the University of Alberta was $r = -0.68$ in a pure line of Red Bobs 222 in 1930 and -0.42 in Marquis in 1931. Removal of tillers or spikes to reduce yield increased protein content in both years and weight per 1,000 kernels in 1930, but did not affect grade and kernel texture.

Variation of protein quality in wheat grown in aqueous culture media, W. F. GERICKE (*Cereal Chem.*, 10 (1933), No. 4, pp. 347-359, figs. 4).—Wheat plants were grown in complete nutrient solution up to heading and then were grown in tap water or solutions of the nitrates of calcium, sodium, or potassium. Treatment with sodium nitrate in the later growth stages compared with the other treatments was detrimental to quality as evidenced by baking tests.

Effect of nitrate salts supplied to wheat grown in liquid media on bread scores, II, W. F. GERICKE (*Cereal Chem.*, 11 (1934), No. 2, pp. 141-152, figs. 6).—Bread scores of wheat provided in culture in later growth phases with one of the nitrates of ammonium, calcium, potassium, magnesium, and sodium or with ammonium chloride, excluding all other elements required in a complete nutrient solution, demonstrated the order of excellence of calcium nitrate, potassium nitrate, and sodium nitrate and the markedly poorer quality of ammonium nitrate. Ammonium salts supplied during the later growth stage of wheat resulted in higher protein values in the grain than did nitrate salts, but the quality of the flour was decidedly inferior in baking properties. From the data it appeared that quality in protein is markedly affected by the mineral nutrition of the wheat plants, and is affected by the concentration of the culture medium and by the character of the salts.

Nitrogen in relation to composition, growth, and yield of wheat, L. D. DONEEN (*Washington Sta. Bul.* 296 (1934), pp. 71, figs. 2).—Experiments reported dealt with the effects of different quantities (150, 300, and 600 lb. per acre in 1930 and 500 lb. in 1931) of nitrogen fertilizer applied in field plats at different growth stages on the metabolism, yield, and composition of the wheat plant, and comparative differences in behavior shown among eight winter wheat varieties in response to the several treatments.

Addition of sodium nitrate to soil with available nitrogen adequate for large grain yields retarded growth during the vegetative period and did not materially increase yield or nitrogen content of grain, but when available soil nitrogen was limited the sodium nitrate stimulated growth and increased grain yield and nitrogen content.

The carbohydrate-nitrogen relationship in the plant tissue was not affected by fertilizer treatment or by varietal characteristics during the growing season with high or low nitrogen fertility of the soil. Applications of sodium nitrate to soil low in available nitrogen caused increases in total nitrogen and soluble noncoagulable nitrogen of the plant during the vegetative stage. The nitrate nitrogen content of the plant juice was increased temporarily just after the fertilizer was applied. The maximum dry weight occurred and the maximum quantity of nitrogen was absorbed at the blooming stage. The amounts of dry weight and nitrogen in the tops of the plants decreased

between blooming and maturity. The loss in dry weight and nitrogen in the plants was related directly to lack of available soil moisture, provided available nitrogen in the soil was enough to produce a large yield. Wheat on the plats with the least moisture suffered the greatest loss from the above-ground parts.

Some varieties had a greater tendency than others to adapt themselves to extreme environmental conditions, such as an excess of available soil nitrogen or a deficiency in soil moisture for growing and maturing the wheat crop, whereas, under favorable edaphic conditions, varietal characteristics as to yield and quality of grain were largely overcome by addition of nitrogen fertilizer after tillering had ceased. Nitrogen fertilizer supplied after normal tillering had stopped resulted in the production of new tillers and greatly increased the yield of grain without affecting the size of the kernels materially. The author concludes that, by controlling the available nitrogen content of the soil, varietal characteristics were largely overcome with respect to growth and yield of grain, provided the moisture supply of the soil was adequate at all times.

Soft winter wheat studies, I, II (*Cereal Chem.*, 10 (1933), No. 2, pp. 140-148; 11 (1934), No. 2, pp. 121-140).—The studies are reported in two parts.

I. The suitability of the A. A. C. C. basic baking procedure for the determination of strength, E. G. Bayfield and V. Shiple.—Baking tests on soft winter wheat flours of the 1931 crop suggested that this baking procedure was not well adapted for determining their strengths, the 58 percent absorption basis being too high for flours from ordinary Ohio wheats and the 2.5 g of sugar in the basic formula being too low. Indications were that the bromate differential test might be used to advantage in rating varieties of winter wheat according to strength.

II. Evaluating experimentally milled flours with the aid of viscosity, fermentation, and baking tests, E. G. Bayfield.—Ohio Experiment Station studies on 10 wheat varieties grown at several locations in Ohio in 1932 showed that variety is much less important than environment as a factor causing variation in quality. The quality of these wheats was gaged by baking, viscosity, and fermentation tests which were indicated of value in the order given. The relationship between crude protein and loaf volume, or between crude protein and maximum viscosity of acidulated flour-water suspensions, was positive and high. The viscosity test showed possibilities as a substitute for the bromate baking test for measuring strength. Viscosity also proved to be highly and positively correlated with fermentation tolerance as measured by the second rise of a dough in a fermentation test.

The Kentucky seed law (*Kentucky Sta. Regulat. Ser. No. 4* (1932), pp. 8).—The text of the law governing the distribution and sale of agricultural seed in Kentucky, effective July 1, 1932, is presented.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul. 384* (1934), pp. 20).—Purity and germination guaranties and important variations therefrom are tabulated and discussed for 697 samples of agricultural seed collected from dealers in Vermont during 1934.

The percentage and viability of weed seeds recovered in the feces of farm animals and their longevity when buried in manure, G. W. HARMON and F. D. KEIM (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 9, pp. 762-767).—When seeds of several weeds and sweetclover were fed to different farm animals at the Nebraska Experiment Station, the percentage recovered from hogs averaged 24.1, calves 23.1, horses 12.9, sheep 10.7, and chickens 0.3, averaging 14.2 percent. An average of 6.7 percent of viable seeds was recovered from 1,000 seeds fed to all the animals. Germination without acid treatment was higher for the

recovered seeds than for unfed seeds, but when treated with sulfuric acid and fed, the recovered seeds averaged 9.2 percent less than the total germination of unfed seeds. Only one-half as many seeds were recovered during the 48- to 80-hour period as during the 0- to 48-hour period, and the former germinated only one-half as high as did those of the shorter period. After burial for 1 mo. in cow manure and horse manure, only velvet weed, bindweed, sweetclover, and peppergrass seed were viable, and after 3 mo. in manure all seeds were dead except bindweed, which germinated 1 percent.

See also notes on similar work in Idaho and Utah (E. S. R., 71, pp. 772, 773).

The control of annual weeds in cereal crops by dilute sulphuric acid, G. E. BLACKMAN (*Empire Jour. Expt. Agr.*, 2 (1934), No. 7, pp. 213-227, fig. 1).—Experiments at eight centers in England showed spraying in fair weather with 9.2 percent (weight/volume basis) of sulfuric acid or 5 percent of copper sulfate to give 94 to 98 percent control of *Brassica sinapis* (yellow charlock), and the acid also eradicated *Galium aparine* (cleavers). A 13.6 to 18.4 percent sulfuric acid spray destroyed over 90 percent of the plants of *Raphanus raphanistrum* (wild radish or jointed charlock) or *Ranunculus arvensis* (corn buttercup), whereas 5 percent copper sulfate was less effective. *Papaver rhoeas* (field poppy) was more resistant than the other weeds to sulfuric acid. Substantial increases in yields of oats, barley, and wheat occurred in several cases after weed control by these sprays. Barley yielded less when treated with 9.2 percent sulfuric acid in later growth stages, but was very resistant in the third leaf stage. Varietal differences were evident. Sulfuric acid sprays did not affect malting quality. The depressing effect of weeds seemed due primarily to shading and not to depletion of available nutrients in the soil.

The comparative cost and effectiveness of tillage and of chlorates in the control of morning glory, Canada thistle, and perennial sow thistle, D. C. TINGEY (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 864-876).—Utah Experiment Station studies on methods of weed control showed that tillage, except for treatments delayed until blooming, was more effective and cost substantially less than chlorates. Costs were based on each plowing at \$3 per acre, each cultivation 50 ct. per acre, and chlorates at 10 ct. per pound, including cost of application. At these rates the more effective chlorate treatments cost from 4 to 8 times more than the better tillage treatments. The importance of beginning tillage early in the spring was evident, since delaying tillage until weed growth was in bloom cost more and required two seasons for eradication. About equally good results were had from weekly cultivation and alternate weekly cultivation, although the latter cost only about one-half as much. While plowing every other week was no more effective than cultivation, it cost more than twice as much. Morning-glory was the most difficult to eradicate by tillage and was followed by Canada thistle and sowthistle, while with chlorates the order was reversed.

Effect of applications of sodium chlorate and ammonium thiocyanate on subsequent sowings of wheat, R. BISSEY and O. BUTLER (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 838-846, figs. 3; also *New Hampshire Sta. Sci. Contrib.* 45 (1934), pp. 838-846, figs. 3).—Marquis wheat was planted in 10-qt. buckets containing soil treated with solutions of ammonium thiocyanate and of sodium chlorate at rates of 100, 200, 400, and 800 lb. per acre. The first crop, harvested after 23 days, was followed in order by a rest period of 40 days, a second crop for 37 days and 31 days rest, and a third crop for 32 days and 14 days rest, and with the chlorate treatment only, a fourth crop for 32 days and 13 days rest and a fifth crop for 38 days.

In the absence of leaching, cultures that received equivalent of 100 and 200 lb. of sodium chlorate per acre ceased to be toxic after 131 and 237 days,

respectively. At the rate at which toxicity decreased in the other cultures, it appeared that injury would persist nearly a year in the case of the 400-lb. application and approach 2 yr. with the 800-lb. application. The period of sterility was short after ammonium thiocyanate treatments. At the 100-lb. rate there was no period of sterility, and even at the 800-lb. rate marked stimulation of growth occurred after 69 days. Inferences were that sodium chlorate persists for a long time unchanged in the soil, but that ammonium thiocyanate is decomposed rapidly.

Effect on the growth of oats of copper sprays used for the control of mustard, O. BUTLER and R. BISSEY (*New Hampshire Sta. Sci. Contrib.* 41 (1934), pp. 693-697).—This is a reprint from another source (E. S. R., 71, p. 767).

The eradication of *Lepidium draba*, H. W. HULBERT, H. L. SPENCE, and L. V. BENJAMIN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 858-864).—The merits of chemicals, tillage, and smother crops for the control of whitetop were studied in heavily and uniformly infested alfalfa in the Boise Valley by the Idaho Experiment Station.

The results suggested that the weed can be eradicated by two applications of chlorates made at 10-day intervals during blooming. With the double treatment method, the most effective combination was a 1-lb. per square rod initial application followed by a 4- or 5-lb. dosage. A later third application did not increase the effectiveness of the chlorate. Surviving plants seemed to develop a resistance to chlorates when the treatments were continued. Single 6-lb. chlorate treatments in late fall gave 100 percent kills. Eradication also was effected by 2-oz. doses of carbon bisulfide applied to from 6- to 8-in. depths at from 18- to 20-in. intervals. The best method for eradication of large infestations included two seasons of thorough tillage followed by 2 yr. of check-rowed crops. Frequent irrigation did not change the effectiveness of tillage operations. Thickly seeded smother crops could not replace a second season's tillage.

HORTICULTURE

[Horticulture at the Missouri Station] (*Missouri Sta. Bul.* 340 (1934), pp. 62, 63-65, 66, 67).—There are discussed briefly the results of variety tests of walnuts, pecans, and filberts, by T. J. Talbert and A. E. Murneek; attempts to discover late-blooming sweet cherries, by Talbert; the relative absorption of N, P, and K by young apple trees, by Murneek; the fertilizer requirements of strawberries and the effect of the differential nutrients on the time of flower bud formation, by Murneek and J. H. Long; methods of determining the mineral elements in apple tissue, by Murneek and E. J. Gildehaus; fertilization of grapes, by H. G. Swartwout; factors determining hardness in fruit trees, by Talbert, C. G. Vinson, and Swartwout; metaxenia in apples and squash, by Murneek and A. D. Hibbard; and the nature of abscission of immature apples, by Murneek.

The home vegetable garden, A. M. BINKLEY (*Colorado Sta., Bul.* 357, rev. (1934), pp. 51, figs. 25).—This is a revision of a previously noted bulletin (E. S. R., 63, p. 137).

Vegetable-crop production in Suffolk and Nassau Counties, F. O. UNDERWOOD ([*New York*] *Cornell Sta. Bul.* 611 (1934), pp. 64, figs. 14).—Based on visits to approximately 310 farms, information is presented on the acreage of different vegetables in these Long Island counties, effects of climate on vegetable production, types of vegetable farming, principal soil types utilized, soil reaction as related to vegetable production, and fertilizer usage in crop-

ping systems. In addition specific information on cultural and fertilizer practice is presented for the leading crops, notably spinach, beets, carrots, parsnips, tomatoes, potatoes, cauliflower, cabbage, sweet corn, brussels sprouts, and lima beans.

[Vegetable investigations at the Wisconsin Station] (*Wisconsin Sta. Bul.* 428 (1934), pp. 70, 76-78).—Brief mention is made of the canning and other desirable qualities of the new wilt-immune Wisconsin Perfection pea developed by E. J. Delwiche, variety tests with rutabagas by Delwiche, and of results of testing varieties of beans, beets, chard, spinach, sweet corn, and tomatoes, by J. G. Moore and O. B. Combs.

Cauliflower and sprouting broccoli, W. D. ENZIE (*New York State Sta. Circ.* 152 (1934), pp. 8, fig. 1).—General information is presented on the various phases of production.

Muskmelon growing in New York, W. D. ENZIE (*New York State Sta. Circ.* 151 (1934), pp. 11, fig. 1).—A presentation of general information.

Relation of scalding practice and storage temperature to quality retention in frozen pack peas, H. C. DIEHL and J. A. BERRY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 496-500, fig. 1).—Studies conducted by the U. S. Department of Agriculture revealed a general correlation between catalase activity and heat penetration in scalded Alderman peas, as indicated by color changes in the tissues. Prolonged scalding in water at 210° F. beyond 30 sec. served no useful purpose in destroying enzymes and caused undesirable softening and fading of the green color. After 5 mo. at 20° unscalded peas exhibited undesirable odor and flavor, whereas the 30 sec. at 210° lot was good. The importance of rapidly cooling the scalded peas down to about 55° is indicated. The original color of scalded peas was retained over long storage periods only at -5°. Very rapid freezing at -85° followed by storage at -5° to 10° gave no better color than immediate storage at -5°. Organoleptic and microscopic tests after thawing on uncooked as well as heated frozen peas failed to show any significant quality or structural change in properly scalded peas within the range of -92° to 15°. It is concluded that temperatures near 0° are satisfactory for peas and other vegetables if the product is cooled with reasonable rapidity.

Using the normal frequency curve in pomological research, R. D. ANTHONY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 406-409, fig. 1).—The author briefly discusses a method of analyzing by frequency curves the results of observations in 1931, 1932, and 1933 of the shoot growth of Stayman Wine-sap trees growing at the Pennsylvania Experiment Station in boiler plate rims sunk in the soil and so treated that each rim received a different treatment, ranging from nothing up to 6 units of chopped rye combined with nothing up to 5 units of nitrogen. The method of analyzing results by frequency curves, also used with chemical data on the leaves of the same trees, is said to give a complete picture of results and to permit the following of changes from year to year.

Ground water as a measure of the suitability of a soil for orchard purposes, J. OSKAMP (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 410-414, fig. 1).—Following an earlier paper (*E. S. R.*, 69, p. 54) in which it was suggested that ground water is a practicable method of determining orchard drainage conditions, readings were taken in an orchard at Hall, N. Y., upon which 10 yr. of individual tree yield records were available. Two ground water measurements were taken at each tree. Those of May 16 showed a correlation of 0.678 ± 0.05 between the depth to water and yield. Soil pH was higher where the drainage was poorer. Statistical study of the data indicated that readings at every eighth tree would give an accurate picture of conditions.

Data taken in the Cornell University orchard at Ithaca also showed higher yields where the ground water level was lower, and also that the Baldwin is less resistant to unfavorable drainage than is McIntosh. Heavy mulching tended to raise the water table. Tile in a heavy soil tended to lower the water table within 4 ft. of the tile but very slightly 16 ft. away. The tree itself was found considerable of a factor in lowering the water in its immediate vicinity.

Fruit pollination (*Tasmanian Fruitgrower and Farmer*, 19 (1934), No. 230, p. 5).—At the Waihi Institute, South Australia, all varieties of apples tested, including Jonathan, Rome Beauty, Gravenstein, Delicious, Cox Orange Pippin, and Twenty Ounce, were found commercially self-unfruitful. Granny Smith, Yates, and Statesman proved satisfactory pollinizers for Jonathan. Beurre Bosc, Anjou, Howell, Packham, Winter Cole, Josephine de Malines (Josephine), Kieffer, Bartlett (William Bon Chretien), Winter Nelis, and Comice pears were found partially self-fruitful, but to benefit by cross-pollination. Seasonal conditions influence self-pollination to some extent in both the apple and the pear.

The effect of various low temperatures upon the after-ripening of fruit tree seeds, I. C. HAUT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 365–367).—Seeds of Kieffer pear, McIntosh apple, Late Crawford peach, and mazzard and mahaleb cherries collected at harvest and held for 2 mo. in an air-dried condition at room temperature were soaked in water for 48 hr. and then stratified in sand at temperatures ranging from -3° to 8° C. In some lots temperatures were alternated but with unfavorable results. In the Kieffer, continuous 0° , 3° , and 8° were effective afterripening temperatures, with the best results at 3° . Similar results were secured with the other four fruits, except that -3° was even less effective than with the pear. Germination occurring in storage at 8° rendered this temperature commercially undesirable. At 3° high germination was secured with the Kieffer after 45 days of afterripening, after 60 days with the apple, 100 days with the mazzard cherry, 88 days with the mahaleb cherry, and 75 days with the peach.

Little-leaf or rosette of fruit trees, III, W. H. CHANDLER, D. R. HOAGLAND, and P. L. HIBBARD (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 70–86).—Continuing previous work (*E. S. R.*, 70, p. 494), studies were made of various methods of control, including soil treatment, spraying, and direct injection. Zinc sulfate applied at one side of the tree was highly beneficial to that side alone. The application of zinc sulfate to the soil during the growing season caused severe injury under certain conditions, leading to the suggestion that in the case of deciduous trees treatments should be applied in the dormant period. Spraying experiments with various fruits indicated that this method is most effective with grapes and oranges. One annual spraying with zinc-lime (10–5–100) was sufficient to keep grapevines free from little leaf. Striking responses were secured by inserting zinc and certain zinc compounds directly in the trunk. Of a large number of metallic substances inserted in trees, none except zinc proved of any value. Calcium compounds applied to the soil had no effect on little leaf, and in some cases caused injury.

Determinations of zinc in shoots and leaves of little leaf and healthy trees gave little evidence in the case of the leaves, but the shoots of diseased trees were lower in zinc than those of healthy trees. Trees grown in tanks containing little leaf soil failed to develop little leaf symptoms, presumably because of the zinc in the pipes or hose. Actually more zinc was found in the shoots than in trees in the orchard from which the soil was taken. The occasional recovery of trees without any apparent change in the zinc supply is said to leave the causal problem still unsolved.

The circumferential variability of five varieties of apple trees on seedling and scion roots, F. S. LAGASSÉ (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 377-381, figs. 3).—Further observations (E. S. R., 68, p. 49) by the Delaware Experiment Station on a lot of Yellow Transparent, Stayman Wine-sap, Delicious, Grimes Golden, and Rome Beauty trees growing on their own and on seedling roots showed that although the own-rooted trees, with the exception of Rome Beauty, after five seasons in the orchard still had higher coefficients of variability than the seedling-rooted trees, in general the own-rooted trees had not increased as much in variability as had the same varieties on seedling roots. The author suggests that by selecting own-rooted trees from large populations it should be possible to obtain for experimental purposes a type of tree less variable than seedling-rooted stocks.

Crotch angles in young trees, F. HORSFALL, JR. (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 375, 376).—Studies at the Missouri Experiment Station of several thousand 1-year-old Kieffer pears budded on *Pyrus ussuriensis* showed that a large ratio of trunk to limb diameter is positively correlated with wide-angled crotches. Those trees with strong leaders formed crotch angles averaging 64°, whereas the top limbs of neighboring trees of weaker growth formed narrow crotches. In headed Jonathan trees the young limbs were observed to grow almost vertically for an inch or so and then change their course almost to a horizontal position.

Retention of carbon dioxide gas in the intercellular atmosphere of pears and apples, F. GERHARDT and B. D. EZELL (*Science*, 80 (1934), No. 2072, pp. 253, 254, fig. 1).—Determinations by the U. S. Department of Agriculture of the carbon dioxide in the intercellular spaces of Beurre Bosc pears and Jonathan apples following an exposure to 35 percent carbon dioxide for 24 hr. at 65° F. showed much greater absorption in the pear than in the apple, the percentages of concentration being 80 and 50, respectively. Approximately 70 percent of the accumulated carbon dioxide was lost within 8 hr. after removal from the carbon dioxide atmosphere, and after 14 hr. there was no surplus.

A note on fruiting apple spur phyllotaxy, H. L. COLBY (*Plant Physiol.*, 9 (1934), No. 4, pp. 858, 859).—Observations at the Oregon State College showed that fruiting spurs of the apple usually carried from 8 to 10 leaves below the terminal fruit stalks on the cluster base. With 8 leaves the phyllotaxy was three-eighths and with 10 leaves two-fifths. Spurs with less leaves were generally unfruitful.

The seasonal cycles of nitrogenous and carbohydrate materials in fruit trees.—I, **The seasonal cycles of total nitrogen and of soluble nitrogen compounds in the wood, bark, and leaves portions of terminal shoots of apple trees under two cultural systems—grass plus annual spring nitrate and arable without nitrogenous fertilizer,** D. V. KARMARKAR (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 3, pp. 177-221, figs. 33).—Studies at the Long Ashton Research Station, England, on the chemical changes occurring throughout the year in the current season growth of Newton Wonder apple trees propagated on Malling No. II understocks and grown in both tilled and grassed plats showed definite seasonal cycles in the wood, bark, and leaves. A generally higher N status was observed in the tilled than in the sod-grown trees, but a spring application of NaNO_3 to the sod failed to influence the character of the N cycle. A definite migration of N from the leaves to the shoots occurred in autumn. N determinations included total protein and nonprotein, nitrate, ammonia, acid amide, humin, basic, imide, and an unidentified portion characterized as rest, N. Cycles of N constituents were apparently more simple in the wood than in the bark. Nitrate N was found in the leaves in

appreciable amounts in June, declining steadily throughout the season to very low values.

Effectiveness and safety of fungicide-arsenical spray combinations on apple in the Champlain Valley of New York. A. B. BURRELL (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 87-94).—In this second report (E. S. R., 69, p. 821), lime-sulfur and Koppers flotation sulfur are again said to have given excellent control of scab on the McIntosh apple. A third material designated as nickel flotation sulfur also gave fine results. The flotation sulfur plats were practically free from foliage injury, whereas there was a small to moderate amount of injury on the lime-sulfur trees. Two sprayings in July of calcium arsenate and flotation sulfur paste reduced maggot injury to a marked degree. Manganese arsenate and flotation sulfur also gave good control of the maggot. Some evidence was secured that manganese arsenate lies between calcium arsenate and lead arsenate in codling moth control. The use of zinc sulfate and hydrated lime in combination with calcium arsenate and lime-sulfur or calcium arsenate and flotation sulfur apparently reduced foliage injury slightly. Ferrous sulfate was also effective in lessening injury. It was found that by substituting calcium arsenate for lead in the later cover sprays the arsenical and lead residues could be materially decreased.

Trials with pear stocks in New York.—Preliminary report, H. B. TUKEY and K. D. BRASE (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 361-364, fig. 1).—The susceptibility of *Pyrus communis* stock to woolly aphid, leaf spot, and fire blight led to a trial at the New York State Experiment Station of *P. communis*, *P. betulaefolia*, *P. calleryana*, *P. serotina*, and *P. ussuriensis* as understocks for Bartlett, Seckel, Anjou, and Kieffer. *P. communis* understocks proved uniformly successful. *P. betulaefolia* was excellent for Bartlett, Seckel, and Kieffer but unfavorable for Anjou. *P. calleryana* was worthless for all four varieties. *P. ussuriensis* was congenial with Kieffer but resulted in weak trees with Anjou, Bartlett, and Seckel. *P. serotina* was satisfactory as an understock for Kieffer but ill adapted to Bartlett and Seckel.

The effect of size and of seed parent on the growth of pear seedlings. L. D. DAVIS and W. P. TUTTS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 368-372).—At the California Experiment Station at Davis two populations of pear seedlings obtained from Beurre Hardy and Winter Nelis pollinizers in a Bartlett pear orchard averaged 15 and 15.2 mm in diameter, respectively, at the end of their first growing season after transplanting. The distribution of size in each progeny approximated normal. Portions of each lot were budded to Buerre Bosc, Buerre Hardy, Bartlett, and Winter Nelis. Measurements at the end of the first season after budding showed the trees on Winter Nelis understocks to have greater diameter than those on Beurre Hardy roots, although in only five cases were the differences significant. Correlations of the diameters of seedlings with those of the budded trees showed little or no relation between the size of the seedlings as they came from the seed bed and the growth or size of the young tree. There was little or no difference between the vigor of the two stocks as shown by size at the end of 2 yr. Buerre Hardy scions made the largest growth of any of the four varieties used.

Studies of the irrigation of pear orchards on heavy soil near Medford, Oreg., M. R. LEWIS, R. A. WORK, and W. W. ALDRICH (*U. S. Dept. Agr., Tech. Bul.* 432 (1934), pp. 34, figs. 9).—In this joint study carried on by the U. S. Department of Agriculture and the Oregon Experiment Station during the years 1930, 1931, and 1932 in two commercial orchards, a Bartlett and an Anjou, both located on impervious sticky soils, it was found that the rate of growth of fruits was very closely related to moisture content of the upper 3 ft. of soil. Whenever the moisture fell below 70 percent of the available capacity the rate

of growth declined. A shortage of water was especially critical during the latter part of the growing season when the rate of growth was most rapid. No correlation was established between variations in soil moisture and storage or dessert quality, but high moisture favored the production of larger fruits, greater yields, and the greatest profits. In the Anjou orchard the cost of extra irrigation required to maintain high soil moisture was less than the increased returns. In the Bartlett orchard the economic results were confused with other factors.

The results are said to indicate clearly that the number of irrigations, depth of penetration, or both, are not always reliable indexes to soil moisture conditions. It was difficult and often impossible to secure sufficient penetration to the entire root zone. The number of irrigations required to maintain the soil moisture above the established minimum of 50 percent of capacity may be expected to vary with the season and with orchards. A frequent examination of the subsoil with an auger or similar tool is considered advisable.

Ripening dates of Grand Duke plums on various understocks, L. H. DAY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 357-360).—Observations at the California Experiment Station, Davis, in the summer of 1932 showed Grand Duke plums on peach and on Wickson plum trunks to ripen their fruits approximately 1 day earlier than trees worked on Formosa plum and Sergeant prune and from 2 to 3 days earlier than trees worked at the ground level on seedlings of peach, apricot, myrobalan, and almond. In all cases early ripening occurred as the result of uncongenial combinations, abnormal unions, and partial girdling. There were no easily recognizable differences in the character of the fruits from the various combinations, although in the case of a wire-girdled branch the fruits averaged 89 g as compared with 54 g for the rest of the tree. In some of the Formosa-Grand Duke grafts the tissues were so loosely joined that a knife blade could be thrust between them.

Phosphorus in alternate-bearing sugar prunes, C. COMPTON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 151-153, fig. 1).—In this study, conducted by the California Experiment Station with alternate bearing sugar prune trees, there were found in January, February, March, and early April larger amounts of phosphorus on a percentage basis in the wood, bark, and spurs of trees about to blossom than of those not destined to bloom that season. From April onward the phosphorus content of all three fractions was continuously higher in the nonfruiting than in the fruiting trees. The maximum phosphorus content in the nonbearing trees was not reached until the subsequent March of their fruiting year. Apparently phosphorus content reflected the alternate bearing condition of the two groups of trees. In contrast to the wood, bark, and spurs the content of phosphorus in the leaves did not reflect the bearing condition of the trees. On a percentage basis phosphorus content of the leaves attained a maximum in early spring and decreased from then on during the season.

A physical consideration of the mechanism of the cracking of sweet cherries, E. SAWADA (*Sapporo Nat. Hist. Soc. Trans.*, 13 (1934), No. 3, pp. 365-376, figs. 5).—Having observed that the cracks in mature sweet cherries generally occur along the most acute angled parts of the surface, measurements were made at the Hokkaido University, Japan, of the surface curvatures of Bigarreau Jabouley cherries. It was found that the body of the fruit is composed of ellipsoidal surfaces all lying in the longitudinal direction of the fruits, and that the location of the cracks corresponds closely with the tensions that would be expected in an ellipsoidal object subjected to internal hydrostatic pressure such as occurs in the cherry fruit following rains. It is concluded

that the types of cracking are determined primarily by the curvatures of the fruit's surface.

Twelve years of strawberry breeding.—II, From 170,000 seedlings, seven named varieties. A summary of the crosses made and an evaluation of their effectiveness as breeding material, G. M. DARROW, G. F. WALDO, C. E. SCHUSTER, and B. S. PICKETT (*Jour. Heredity*, 25 (1934), No. 11, pp. 450-462, figs. 3).—In this second contribution (*E. S. R.*, 70, p. 481) there is presented a critical evaluation of the breeding value of a large number of strawberry varieties which have been used by the U. S. Department of Agriculture in cooperation with the North Carolina Department of Agriculture and the Oregon Experiment Station in strawberry improvement. A list of the more important crosses is presented. Of the 170,000 seedlings derived only 7, Southland, Narcissa, Fairfax, Redheart, Dorsett, Bellmar, and Blakemore, have so far been introduced to the public. It is interesting to note that Howard 17 is one parent of 5, and possibly 6, of the 7 new varieties. Other varieties, notably Klondike, have failed to yield a significant number of promising seedlings.

Summer mulching the strawberry, R. E. LOREE (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 2, pp. 74, 75).—Tests of paper, straw, peat, and other materials as summer mulches for Mastodon and Premier strawberries growing in a sandy loam soil failed to show any significant differences in favor of any material, nor were there striking differences in total yields between the mulched and unmulched plants. The chief benefit of mulching was in cleanliness of the fruit and the control of weeds. Straw, because of its low cost, was found the best material for both home and commercial plantings.

Raspberry growing in Michigan, R. E. LOREE (*Michigan Sta. Circ.* 152 (1934), pp. 39, figs. 9).—This is a presentation of general cultural information, preceded by a discussion of the present status and outlook for the industry in Michigan. Observations on the yield and root distribution of plants as correlated with water levels showed the importance of good drainage. Where the water table was high throughout the season or, even for a few weeks in spring, root systems were shallow, growth was poor, yields were low, and the plants short lived.

The cultivation of the highbush blueberry (*Vaccinium corymbosum*), S. JOHNSTON (*Michigan Sta. Spec. Bul.* 252 (1934), pp. 52, figs. 22).—General information is presented on the present status of the cultivated blueberry industry, soil and temperature requirements, propagation, pollination, named varieties, fertilizer needs, pruning, harvesting and marketing, spray residues, control of diseases, and the maintenance of the native blueberry plantations.

In a soil reaction experiment Rubel plants growing in boxes of sand and of muck made their best growth at pH 4.4, and at pH 3.4 growth in muck was almost as good as at pH 4.4. Where the water table was held at 6, 14, 22, and 30 in. Rubel plants yielded best at 14 in. Field observations on a knoll confirmed the importance of abundant soil moisture, especially in April, May, and June. Flowers in full bloom were found resistant to temperatures as low as 23° F., but serious damage was observed from freezing when the fruits were about one-third developed.

Further propagation studies (*E. S. R.*, 63, p. 537) showed the value of high frames and of suspended beds as compared with those placed directly on the soil. With respect to protection, a close-fitting burlap shade gave almost as good results as glass for hardwood cuttings. With softwood cuttings a combination of glass sash and burlap shade proved best. German peat proved the best propagating medium. Much larger percentages of fruit were obtained by self-pollination than by simply covering the blooms. Among fertilizers tested on Rubel plants superphosphate at the rate of 335 lb. per acre gave very

good results, and the same quantity of a 5-10-12 gave good results. Nitrogen proved of little value, but some indication was obtained that potash was beneficial. Of different types of pruning the removal of fine growths and heading back moderately of some of the oldest shoots gave evidence of being most satisfactory. Pruning is not deemed necessary in the first 3 yr. Even one dusting of plants with calcium arsenate left a residue above the tolerance. The removal of pin cherry, soft maple, and other competitors from a plantation of wild bushes when accompanied by moderate pruning and application of complete fertilizer proved profitable, but a heavy heading of the plants greatly reduced yields.

Propagation experiments with avocado, mango, and papaya, H. P. TRAUB and E. C. AUCHTER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 382-386).—Tests by the U. S. Department of Agriculture of 16 mediums for germinating avocado seeds showed the most rapid development during the rainy summer season in 10-mesh charcoal and in a mixture of carex peat plus sand and charcoal. In the cooler and drier fall period cypress sawdust plus charcoal was also effective. The best seedlings were secured in the rainy season in sphagnum peat and cypress sawdust plus charcoal, and in the drier season in sphagnum peat plus sand and carex peat plus sand and charcoal. The Orlando fine sandy loam gave poor results with mango seeds. Good success was secured in sprouting immature avocado seeds and also the individual cotyledons or portions thereof. However, plants grown from half and quarter embryos were smaller than those from whole embryos. The technic of embryo graftage is discussed with relation to the avocado and mango. Attempts to propagate the papaya and avocado by cuttings were wholly unsuccessful.

Size and age of budwood in relation to size of yearling citrus scions, F. F. HALMA (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 373, 374).—Measurements by the California Experiment Station at Riverside on the first season's growth of Valencia buds taken from sticks ranging from 3 to 11 mm in diameter and worked on sweet orange roots showed little effect of bud stick size on the young tree, the average cross sectional scion trunk areas being practically the same throughout. Comparing buds from the apical and basal halves of sticks 30 cm or more in length, the average growths of the scions at the end of the first season were identical. Even when bud sticks were taken from two distinct growth cycles, development during the first year was practically the same.

Some effects of special practices influencing the nutritional balance on yield, texture, and time of maturity of grapefruit, A. F. KINNISON and A. H. FINCH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 95-97).—Of four treatments, namely, nitrogen fertilization, girdling, varying the harvest date, and shading, tried by the Arizona Experiment Station in attempts to influence the physiological behavior of grapefruit trees growing on the Yuma Mesa, none influenced shedding of the young fruits to any material extent. Continuous shading for 2 yr. resulted in a failure to blossom and in long, slender growth. Girdling tended to earlier maturity and to a higher relative percentage of total soluble solids and a lower acid content in the juice. Repeated girdling and also excessive nitrogen applications tended toward larger fruits, but size of fruit was not consistent with any treatment. Delayed harvest reduced the yields the subsequent season as compared with early harvests. The heavily nitrated trees produced fruit with higher acid content and retarded color. The anatomical features of the several lots of trees are discussed.

Cytology of the genus Coffea [trans. title], C. A. KRUG (*Züchter*, 6 (1934), No. 7, pp. 166-168, figs. 9).—At the Agronomy Institute, São Paulo, Brazil, there were counted 44 chromosomes in the root tip cells of the *nacional*, *bourbon*,

laurina, *maragogipe*, and *amarella* varieties of *C. arabica*, and 22 in *C. canephora*, *C. excelsa*, and *C. congensis*, respectively. In the tetraploid forms investigated, meiosis proceeded in a completely normal manner. The great variability in the progeny of an individual coffee plant leads to the supposition that cross-pollination occurs freely in this genus.

Leaf area and shoot growth in relation to size and filling of filberts. C. E. SCHUSTER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 392-395).—Adjustment of the leaves per nut on girdled and nongirdled shoots of Oregon-grown Barcelona filberts showed, particularly in girdled shoots, a close correlation of available leaf area with the percentage of normal nuts produced. On the nongirdled shoots normal nuts were more abundant and there was much less variation in weight. Data on the Merveille de Bolwyller variety showed much wider variation in size of nuts than in Barcelona. Measurements of leaf area as associated with the percentage of normal nuts and their average weights indicated that an area of 151 cm² or above yields nuts of about the same weight. Areas of over 300 cm² were necessary to yield 100 percent of normal nuts. A correlation of 0.899 ± 0.006 was established between length of shoots and leaf area on producing shoots.

Coating pecan trees with paraffin in experimental stage and still an unsafe practice. H. L. CRANE and G. P. HOFFMANN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 401-405).—Although coating young pecan trees with paraffin prior to or shortly after planting resulted in earlier budding, it was observed in these studies, conducted by the U. S. Department of Agriculture near Meridian, Miss., with 1-year-old Success and Schley and 2-year-old Moneymaker, Moore, and Schley trees, that by May 20 many of the trees showed an oil-soaked area extending from the top to the base on the west side. Oak and elm trees behaved in like manner. Apparently the melting of the paraffin was due to absorption and accumulation of heat beneath the coating. It is conceded likely that the paraffin acted like glass and changed light rays into heat rays. With the advance of the season the oil-soaked areas became more manifest, and by September 29 only 15.6 percent of the 1-year-old and none of the 2-year-old trees were free from injury.

X-ray dosage in relation to germination of pecan nuts. H. P. TRAUB and H. J. MULLER (*Bot. Gaz.*, 95 (1934), No. 4, pp. 702-706, fig. 1).—Observations on the germination of nuts of the Halbert and Payne varieties treated with X-rays for periods ranging from 10 to 160 min. and subsequently stored at from 32° to 34° F. prior to sprouting indicated that under the conditions an irradiation of more than 20 min. was followed by a progressive decrease in viability. Certain of the embryos from irradiated nuts showed marked multiple sprouting and some plants were dwarfed. In some nuts the seed germ was killed while the cotyledons functioned. In other cases the taproot developed with no above-ground sprouts. The maximum X-ray dosage for pecan nuts is believed to lie between 40 and 80 min.

A preliminary report on growth rate studies on the pecan. A. C. GOSSARD (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 396-400, figs. 4).—Measurements taken by the U. S. Department of Agriculture on bearing trees of Schley, Stuart, and Success pecans in an orchard in Mobile County, Ala., showed that the longest shoots of one year produce the most rapidly growing and longest shoots the next year, and that the shoots which grow most rapidly at the beginning of the season attain the greatest total length at the end of the season. In general, blooming shoots with the lowest rate of growth and the least total length produced the fewest blooms per shoot and vice versa. The number of nuts matured per shoot was directly related to the rate of growth and the

total length of shoots. Blossoming shoots of low growth rate and small total growth dropped most or all of their blossoms or nuts before maturity. In general the three varieties exhibited the same tendencies.

Pecan root growth and development, J. G. and N. C. WOODROOF (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 6, pp. 511-530, figs. 19).—In reporting further on pecan studies at the Georgia Experiment Station (E. S. R., 70, p. 52), the authors discuss certain morphological, physiological, and anatomical characters of roots as related to growth and development. In general the spread of roots was about twice that of the branches, with few roots occurring below 5-ft. depths. Feeding roots concentrated near the surface were found to be frequently killed by drought, freezing, and cultivation but to grow again quickly on the restoration of favorable conditions. Root pruning stimulated branching and is considered a possible advantage. On dividing young roots into large and small groups, it was observed that each group possesses rather distinct anatomical characters and that most of the small roots are mycorrhizal. Pith was found only in taproots, and hairs were absent from roots of all classes. No distinct epidermis was observed in pecan roots, and the number of cells composing the various regions of individual roots varied greatly.

Fertilizer experiments with pecans, G. H. BLACKMON and R. W. RUPRECHT (*Florida Sta. Bul.* 270 (1934), pp. 48, figs. 5).—Cooperative experiments located on soils of the Bladen, Coxville, Norfolk, and Orangeburg series showed that pecan varieties vary in productiveness and adaptability on different soils. On unsuited soils no amount of any kind or mixture of fertilizer returned profits. Varietal susceptibility to disease was also an important factor, the Schley, for example, being highly susceptible to scab. Regardless of the kind of materials used, 88 percent of the treatments in the experiment increased yields above no fertilizer. Frotscher, Schley, and Stuart varieties did not in general respond as favorably to fertilizer as did Curtis, Moneymaker, and others.

It was apparent that the size of the tree was an important index to the amount of fertilizer required and that in general 1 lb. should be applied annually for each inch of circumference. In the experiments on Bladen soil no particular benefit was obtained from divided over single applications. Some slight indication was seen that sulfate was better than muriate of potash for the Schley pecan. The indications were in favor of complete fertilizer. Manganese and copper sulfate used as amendments to a 4-8-6 material had no appreciable effect on growth or yield of Moore pecans on Norfolk soil.

Analyses of the nuts in the various experiments failed to show any material effect of fertilizers on composition; in fact variations in weather had a greater influence. Frotscher and Stuart produced the largest nuts. Kennedy had the highest fat content and was second in protein. Success and Frotscher were appreciably higher in ash than the others.

Interrelation between cultural treatment of pecan trees, the size and degree of filling of the nuts, and the composition of kernels, H. L. CRANE and M. B. HARDY (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 7, pp. 643-661).—Investigations conducted with Stuart, Pabst, and Schley pecans located in four orchards within 11 miles of Albany, Ga., and subjected to various pruning and fertilizer treatments showed that size and filling of the nuts may be influenced materially by certain practices. Systematic pruning resulted in nuts of higher specific gravity, larger size, and better filling. Nitrogen fertilizers had a similar effect except in seasons of drought when the vegetative stimulation due to the nitrogen apparently decreased the moisture available to the nuts. Analyses of nuts of comparable size and degree of filling showed no influence of orchard treatments on composition. A relatively high degree of filling was invariably associated with a relatively high percentage oil content and a relatively low per-

centage content of protein, carbohydrates, water, and undetermined substances. The authors suggest that determinations of oil and specific gravity or the degree of filling may be utilized in establishing the quality requirements of pecan grades. Conclusions drawn from the analyses of nut samples taken as an aliquot of the whole crop would probably lead to erroneous conclusions, since no account would be taken of the effect of treatment or the percentage of crop falling into the various sizes and degrees of filling.

Notes on pecan filling and maturity, A. H. FINCH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 387-391, fig. 1).—Studies carried on by the Arizona Experiment Station in the Yuma Valley showed a strong correlation between vegetativeness of the trees and the filling, maturity, and premature germination of the nuts. The least vegetative trees had the better filled and earlier maturing nuts, with less tendency to premature germination. The longer the nuts remained on the trees the greater the proportion that germinated. Determinations of soil moisture and soil nitrates in several orchards showed that where moisture was available at all levels soils having the most nitrates produced vegetative trees and poorly filled nuts. Nitrogen determinations upon samples of shucks, nuts and shucks, and tips of nonfruiting shoots collected on October 29 from poorly, moderately, and highly vegetative trees showed the highest percentage content in the material from the highly vegetative trees, except in the case of shoot tips.

Water needs of sweet peas, snapdragons, and chrysanthemums in the greenhouse, A. LAURIE and G. R. MANN (*Ohio Sta. Bimo. Bul.* 171 (1934), pp. 203-205).—Observations on greenhouse-grown sweet peas, using plats of 84 sq. ft. to which were applied 10, 20, 30, and 40 gal. of water per week, respectively, showed the longest stems and longest vines on the 40-gal. plat. Yields were not greatly different in the several areas, and since stem length largely determined sale price the results favored heavy watering, 1 gal. to 2 sq. ft. Comparable results were secured with snapdragons and chrysanthemums.

FORESTRY

Sampling the forest nursery, M. A. HUBERMAN and J. T. MAY (*Jour. Forestry*, 32 (1934), No. 9, pp. 1017-1019).—In the Catahoula Nursery in northern Louisiana a method of counting seedlings in which the number of trees was determined in mechanically selected squares 12 in. on a side and one to each 400 sq. ft. of bed gave a reasonably accurate inventory of the entire stock.

Stand-basal area curves in American yield tables, E. FOSTER (*Jour. Forestry*, 33 (1935), No. 1, pp. 57-60, figs. 4).—Plottings of figures from a total of 20 yield tables showed such a wide variability of relationships and unnatural tendencies as to lead the author to question the degree of perfection in accepted methods of yield table preparation. In certain cases the variation in relation of stand basal area to site quality was a direct opposite of that in others. In only six of the yield tables was the total basal area per acre consistently higher than on poor quality sites.

Use of the Craighead diameter tape for trees under 1.6 inches in diameter, M. S. ABELL (*Jour. Forestry*, 33 (1935), No. 1, p. 83).—A description is presented of an improvised cellophane-covered paper tape used successfully in measuring trees of very small diameters.

A method of determining spacing in thinning, K. DAVIS (*Jour. Forestry*, 33 (1935), No. 1, pp. 80, 81, fig. 1).—A diagram is presented which was successfully used by the Northern Rocky Mountain Forest Experiment Station for

determining the space that should be allotted to a tree of a given diameter in reducing the basal area of a stand per acre to a given figure.

A brief record of seed productivity for chestnut oak in southern New Jersey. O. M. WOOD (*Jour. Forestry*, 32 (1934), No. 9, pp. 1014-1016).—Observations over a 3-year period on the seed-producing capacity of 55 chestnut oak trees located in the New Jersey Pine Barrens area failed to show any significant relationship between seed production and age, size, or vigor. However, the two trees producing the greatest number of acorns had a current growth rate slightly greater than the rest. The 22 trees producing no seed did not differ in appearance from adjacent productive trees. Some suggestion was gained that chestnut oaks undergo a definite periodicity in seed production in this area. In a separate study several sprout trees 8 yr. of age produced viable seed.

Life of Douglas fir seed in the forest floor. L. A. ISAAC (*Jour. Forestry*, 33 (1935), No. 1, pp. 61-66).—Experiments conducted by the U. S. D. A. Forest Service in the Wind River Valley, Wash., in which fresh seed collected in the immediate vicinity was placed in soil or in duff promptly after harvesting, led to the conclusion that Douglas fir seed germinates or decays within a year after it falls, both under virgin timber and on open logged-off land. In each series good germination was obtained the spring following storage in both soil and duff, with no germination in seeds taken up the second, third, and fourth years. At the same time observations on sample plats established on logged-off land showed a direct correlation of seedling crops with the seed crop of the preceding year, and also that the density of the stocking usually decreased with the distance from living trees.

Effect of after-ripening treatment on germination of white pine seeds of different ages. H. I. BALDWIN (*Bot. Gaz.*, 96 (1934), No. 2, pp. 372-376, fig. 1).—In germination tests carried on in a Jacobsen germinator held at a constant temperature of 24° C. (75.2° F.), it was found that in most cases afterripening for several weeks at 8° to 10° in moistened peat increased greatly the rate of germination. The increment was largest in seeds from 2 to 3 yr. old. Four weeks of stratification was generally sufficient to induce complete germination.

The effect of weeding on the survival and growth of white and red pine. W. D. MILLER (*Jour. Forestry*, 32 (1934), No. 9, pp. 1021, 1022).—Measurements taken in 1931 in plats of red and white pine on the Yale Demonstration and Research Forest at Keene, N. H., led to the conclusion that the weeding of such pines less than 10 yr. of age is not economically justified unless there are upward of 800 to 1,000 hardwood trees per acre 1 in. or more in diameter and as old or older than the pines. Weeding in white pine led to a heavy increase in weevil infestation, but in red pine (nonsusceptible to weevil) all hardwoods may be removed without this hazard.

Growth in virgin ponderosa pine stands in central Idaho. C. A. CONNAUGHTON (*Jour. Forestry*, 33 (1935), No. 1, pp. 73-79).—Periodical measurements in a series of permanent sample plats established in central Idaho in 1913 showed a significant net growth in virgin ponderosa pine stands. During 17 yr. the annual gross increment was 281 bd. ft., which with mortality subtracted left a net of 139 bd. ft. Of the 139 bd. ft., 92 were pine and 47 Douglas fir. Approximately 8 percent of the annual increment was derived from new trees. The chief factor in mortality was insect injury, which accounted for 102 bd. ft. annually. Wind and snow caused a loss of 20 bd. ft. per acre per year. The increment in virgin ponderosa pine stands is sufficient to pay the way and should be considered in the preparation of management plans. The Dunning tree classification system used as a basis to study individual trees was found desirable in marking a virgin stand for cutting.

Utilization of northern hardwoods in New York, J. A. COPE (*Jour. Forestry*, 32 (1934), No. 9, pp. 1019, 1020).—A survey of some 400,000 acres of beech, birch, and maple located within a 50-mile radius of Mechanicsville, N. Y., indicated that with a growth rate of 0.5 cord per acre per year there would be sufficient material to permanently yield 30,000 cords annually. A machine for debarking such species as hard maple and beech was successfully demonstrated.

Shaded fire breaks, H. T. GISBORNE (*Jour. Forestry*, 33 (1935), No. 1, pp. 86, 87).—As compared with an air temperature of 98° [F.], a relative humidity of 16 percent, a 5-mile wind, a duff moisture content of 5 percent, and a wood moisture content of 4.5 percent in the open, under a complete green canopy only 300 yd. away the temperature was 93°, the humidity 23 percent, the wind 1 mile in velocity, duff moisture 10.5 percent, and wood moisture 8.5 percent. Under the canopy fighters were often able to check fires that could not be stopped in the open. The author suggests that fire lanes might well be located under canopies.

More about calcium chloride as a forest fire retardant, J. A. MITCHELL (*Jour. Forestry*, 33 (1935), No. 1, pp. 84-86).—Studies carried on by the Michigan Forest Fire Experiment Station in 1933 indicated that calcium chloride is an effective fire retardant and under some conditions may be effectively used in controlling fires. On a jack pine area covered with grass, sweetfern, blueberry, and other vegetation, calcium chloride applied in a water solution at the rate of 0.25 lb. or more per square yard effectively stopped surface fires, except when the wind blew fire across the line or it was carried across in rotten wood.

DISEASES OF PLANTS

The Plant Disease Reporter, November 15 and December 1, 1934 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 18 (1934), Nos. 14, pp. 168-185; 15, pp. 186-191, figs. 4).—Among other items of current interest, these issues contain the following:

No. 14.—Occurrence of curly top in the Pacific Northwest in 1934, by B. F. Dana; curly top of vegetables in Idaho, by C. W. Hungerford; covered smut (*Tilletia decipiens*) of bentgrass (*Agrostis maritima*) in Oregon; and black-heart disease of celery, by A. C. Foster.

No. 15.—Some information on the incidence of corn ear rots (*Diplodia zeae*, *Gibberella saubinetii*, and *Fusarium* spp.) in the 1933 crop, by P. E. Hoppe and J. R. Holbert; leaf spot (*Gloeosporium coryli*) on wild hazel (*Corylus californica*) in Oregon; and Dutch elm disease (*Ceratostomella ulmi*) found at Norfolk, Va.

[**Plant disease studies in Missouri**] (*Missouri Sta. Bul.* 340 (1934), pp. 28-34, 62, 63, 65, 66).—Brief reports are included on the following investigations: The control of damping-off (*Pythium debaryanum*) of tomato seedlings, by C. M. Tucker and C. G. Schmitt (pp. 28, 29); investigations with *Sclerotium delphinii* (pp. 29, 30) and the identification and prevalence of miscellaneous diseases (pp. 30-32), by Tucker; morphological and physiological studies on the genus *Phytophthora*, by Tucker and C. A. Benson (pp. 32, 33); the control of smuts of small grains, by Tucker (pp. 33, 34); testing cabbage varieties and strains for yellows resistance, by H. G. Swartwout (pp. 62, 63); and the virus diseases of plants, by C. G. Vinson (pp. 65, 66).

[**Plant disease studies in Wisconsin**] (*Wisconsin Sta. Bul.* 428 (1934), pp. 73-75, 81-96, figs. 4).—Brief accounts are given of the following work: Breeding a wilt-resistant alfalfa for Wisconsin, by R. A. Brink, H. R. Albrecht, and F. R. Jones (pp. 73, 74); field trials with Ladak alfalfa for combined

disease resistance and winter hardiness, by L. F. Graber and Jones (p. 75); the reduction of potato mosaic by tuber indexing, by J. W. Brann (pp. 81, 82); curl leaf of sour cherry as related to root injury, by L. Langord and R. H. Roberts (pp. 82, 83); prevention of "black root" injury to strawberry by fall mulching, by Roberts (p. 83); damage to potato stands from yellow dwarf disease, by J. C. Walker and K. Koch (pp. 84, 85); the relation of soil conditions to increased potato scab damage, by B. J. Dippenaar, Walker, and L. R. Jones (pp. 85, 86); the importance of rain-borne bacteria in the spread of fire blight, the use of bordeaux mixture for its prevention, and relative fire blight resistance, by G. W. Keitt, J. A. Pinckard, and A. J. Riker (pp. 86-88); the improvement of the spray program for apple scab control, by Keitt, E. C. Blodgett, and Pinckard (pp. 88, 89); continued studies on cherry leaf spot control, by Keitt and Blodgett (pp. 89, 90); development of a suitable antiseptic for nurserymen's tape, by Riker and S. S. Ivanoff (p. 90); study of the metabolic products of crown gall and hairy root bacteria, by H. A. Conor, W. H. Peterson, and Riker (pp. 90, 91); the susceptibility of sweet corn strains to bacterial wilt, by Ivanoff, Riker, and J. G. Dickson (p. 91); the development of a Refugee type canning bean immune to common bean mosaic, and studies of other bean mosaics, by W. H. Pierce and Walker (pp. 91-93); *Fusarium* yellows of celery in Wisconsin, by T. C. Ryker and Walker (pp. 93, 94); the development of 100 percent yellows-resistant late cabbage, by Walker and L. M. Blank (pp. 94, 95); a study of resistance to clubroot in rutabaga and turnip varieties, by Walker and R. H. Larson (p. 95); relation of *Fusarium* wilt of pea to certain soil types, by Walker and W. C. Snyder (pp. 95, 96); and the relative susceptibility of wilt-resistant China asters to other diseases, by R. S. Riker and L. R. Jones (p. 96).

The influence of climatic factors in 1933 and 1934 on the development of several cryptogamic parasites [trans. title], M. F. VIENNOT-BOURGIN (*Compt. Rend. Acad. Agr. France*, 20 (1934), No. 26, pp. 839-843).—Late attacks of *Phytophthora infestans* due to rainy periods seriously affected potato tubers, even when foliage infection escaped notice. The abundant occurrence of the perfect stage of *Microsphaera quercina* on shoots of *Quercus sessiliflora* in October 1934, near Grignon, is thought to be due to some favoring climatic factors.

The genus *Diaporthe* Nitschke and its segregates, L. E. WEHMEYER (*Ann Arbor: Univ. Mich. Press*, 1933, pp. XII+349, pls. 18).—The author has organized an accumulation of 650 species, among which are included important plant parasites, into 5 genera, viz, *Diaporthe* (emended), *Cryptodiaporthe*, *Diaportheella*, *Apioporthe*, and *Diaporthopsis*. Synonymy, hosts, distribution, and location of representative specimens are given with the descriptions. Drawings illustrating habit are supplemented by drawings of spores, which are all reproduced at uniform magnification. There are adequate keys to the species and a good index.

Parasitic and other *Fusaria* counted in Costa Rica and Panama soils, O. A. REINKING (*Zentbl. Bakt. [etc.]*, 2. Abt., 90 (1934), No. 1-4, pp. 4-17).—This is a continuation of earlier reports on *Fusaria* found in tropical American soils (E. S. R., 71, p. 482).

The cytology of *Urocystis occulta*, E. C. STAKMAN, R. C. CASSELL, and M. B. MOORE (*Phytopathology*, 24 (1934), No. 8, pp. 874-889, pls. 3, fig. 1).—In studies at the Minnesota Experiment Station, spores of *U. occulta* were found, on germination, to send out promycelia on which were usually produced from 2 to 6 sporidia that apparently did not become abjoined. On thin smears of oatmeal agar on glass slides, the very young promycelium usually contained

a large, presumably diploid nucleus that divided to produce as many nuclei as there were sporidia. Each sporidium would normally receive one nucleus, presumably haploid. Certain sporidia would then fuse, either at the base, at the tip, or in the H-shape manner characteristic of *Tilletia* spp. The nucleus of one of the fused sporidia would pass through the fusion tube into the other member of the fused pair, and the dikaryophase would begin. From the binucleate sporidium or the fusion tube dikaryotic hyphae grew to considerable length, while the other sporidium died. Occasionally nuclei appeared to pair in the promycelium and pass directly into a sporidium so that the dikaryophase would begin without previous sporidial fusions. In a few cases the authors observed fusion and consequent nuclear association in rather long uninucleate hyphae. Such hyphae appeared to be rare, almost all of the long hyphae observed on oatmeal agar containing 2 or 4 nuclei.

The mycelium in the rye plant appeared to be predominantly binucleate until chlamydospores were formed. It was found that in the spore mother cells the nuclei fuse and the diplophase apparently begins. It is suggested that opportunity for variation due to hybridization would not be so great in *U. occulta* as in smuts of the *U. zeae* type, since the haploid sporidia of the latter become detached and propagate saprophytically while the sporidia of the former have not been observed to abjoin and propagate. Crossing would therefore be restricted to the pairing of nuclei derived from the same diploid nucleus. Sometimes, however, sporidia of different promycelia fuse, thus making possible "wider crossing." Theoretically there should be fewer races in *U. occulta* than in smuts like *U. zeae*. Whether this is true has not yet been determined definitely.—(Courtesy Biol. Abs.)

Partial bibliography of virus diseases of plants, J. I. OTERO and M. T. COOK (*Jour. Agr. Univ. Puerto Rico*, 18 (1934), No. 1-2, pp. 410).—This contribution from the Puerto Rico Insular Experiment Station contains about 3,500 references, including references to many articles as late as 1933 and 1934. There are many annotations indicating the nature of the contributions. The arrangement is alphabetical by authors and chronological under each name. Titles are generally given in the original language, followed by the English translation.

The soil-disturbing effect of acids from smoke [trans. title], A. WIELER (*Angew. Bot.*, 15 (1933), No. 5, pp. 419-433, fig. 1).—Smoke injury to vegetation is held to result partly from the harmful effects upon the roots exerted by the acids washed into the soil. It is stated that less of this type of damage may be expected in soils with abundant basic materials.

Transpirational response of various plants to bordeaux mixture, J. D. WILSON and H. A. RUNNELS (*Ohio Sta. Bimo. Bul.* 171 (1934), pp. 198-202).—Continuing work previously cited (E. S. R., 71, p. 649), the authors tested the effect of bordeaux mixture 4-6-50 on the transpiration rate of 41 different species of plants grown in cans or pots in the greenhouse or outdoors. In the greenhouse test, after determining the normal transpiration rate for 2 days, several of each species were sprayed, and relative rates of water loss were determined for 4 days for the sprayed plants and the remaining controls.

The increases in transpiration from 7 p. m. to 7 a. m., due to the spray ranged from 375 percent for coleus down to 8 percent for celery. The total 24-hr. increase in the same test ranged from 33 percent for cucumber to -2 percent for stock. In the unsprayed plants the percentage of daily water loss that occurred at night ranged from 37 percent for celery to 4 percent for beets and peppers.

In the outdoor tests, some plants in each lot were supplied with water to about 50 percent soil capacity, others to about 30 percent. Half of each lot

was sprayed and the total transpiration determined at 3-day intervals for 12-30 days.

The transpiration increases due to spraying here ranged from 104 percent for corn and beans to 121 percent for hollyhock in the moister soil, and from 91 percent for corn to 116 percent for tomatoes in the dryer soil. In the dryer soil also sprayed plants wilted more severely than the controls, and in some plants leaf-burning occurred even to the point of reducing capacity for transpiration.

Nonparasitic leaf spots of barley, J. J. CHRISTENSEN (*Phytopathology*, 24 (1934), No. 7, pp. 726-742, figs. 6).—According to this paper from the Minnesota Experiment Station, many different types of nonparasitic leaf spots are common in Minnesota on certain barley varieties, varying in size, shape, color, and number of lesions. Some types were characteristic for a particular variety. Some of the lesions resembled spot blotch caused by *Helminthosporium sativum*. No evidence was obtained that the lesions were caused by a pathogen. Some types of lesions were apparently inherited, while others appeared to be the result of possible malnutrition or presence of some toxic principle in the soil. Minute quantities of boron applied to the soil sometimes produced spots that were similar to spot blotch. Treatment with boron did not influence the susceptibility of barley to *H. sativum* or to *Erysiphe graminis*. Seed treatments and spraying or dusting of plants proved ineffective as control measures.—(*Courtesy Biol. Abs.*)

Root-knot and other nematodes attacking rice and some associated weeds, G. STEINER (*Phytopathology*, 24 (1934), No. 8, pp. 916-928, figs. 6).—A review of previously reported nemec parasites of the rice plant is given, and to these are added the root knot nematode (*Heterodera marioni*) and the meadow nematode (*Tylenchus pratensis*). The Arkansas rice roots studied showed less ability to resist infestation by the sedentary *H. marioni* than most plants, through their failure to produce reinforcing tissues around the parasite and the subsequent breaking open of their roots and through stopping growth of the primary root tips, at which locality the parasite seems to concentrate in this host. *T. pratensis* and other nematode parasites of vagrant habits were found mechanically destructive to roots by reason of their continued migration through intercellular spaces. *Echinochloa crusgalli*, a weed associated with the rice plant, was also found to be infested by *H. marioni*, but was histologically better fitted for this parasitism in its ability to form typical root galls with no splitting of the root tissues. Another associated weed, *Amaranthus spinosus*, although a known host of *H. marioni* was not attacked by it in this case.

Illustrations are given of the distribution of the various nemec parasites within rice seedling roots, of the position and effect of *H. marioni* within rice and *Echinochloa*, and of *T. pratensis* and other nematodes within rice and *Amaranthus*. Other nemec associates of these principal parasites are listed.—(*Courtesy Biol. Abs.*)

The root-knot nematode on rice, E. C. TULLIS (*Phytopathology*, 24 (1934), No. 8, pp. 938-942, figs. 3).—In cooperative studies between the U. S. D. A. Bureau of Plant Industry and the Arkansas Experiment Station, the root knot nematode *Heterodera marioni* was found in the tissues of the roots, subcoronal internode, and coleoptile of rice plants (*Oryza sativa*) in Arkansas under field conditions. Root knot nematodes from infested tobacco plants produced typical root knot on rice plants under submerged and nonsubmerged conditions in the greenhouse.—(*Courtesy Biol. Abs.*)

Preliminary note on another foot rot of wheat and oats in Oregon, R. SPRAGUE (*Phytopathology*, 24 (1934), No. 8, pp. 946-948, fig. 1).—In cooperative

studies between the U. S. D. A. Bureau of Plant Industry and the Oregon Experiment Station, a foot rot disease of winter wheat and winter oats was found occurring locally in acid soils in the humid coastal strip of Oregon. The cultural characteristics of the causal organism proved to be identical with those of isolates of *Gibellina cerealis* obtained from Italy, and the symptoms produced in Oregon resemble closely those reported for this fungus in Europe. Mature perithecia have not as yet been found in Oregon. Alstrom spell proved resistant to the disease.

Inheritance of resistance to bunt and leaf rust in the wheat cross, Oro × Tenmarq. C. A. WISMER (*Phytopathology*, 24 (1934), No. 7, pp. 762-779, figs. 3).—A study was made at the Kansas Experiment Station of the inheritance of resistance to bunt (*Tilletia laevis*) in F₂, F₃, and F₄ generations of the wheat cross Oro × Tenmarq. The seed was blackened either with spores of physiologic form 1 from Lincoln County, Kans., or with a composite of spores from 19 collections including 7 physiologic forms, form 1 predominating. The average percentage of bunt infection obtained with the composite sample was very similar to that obtained with form 1 alone.

The results indicate that high susceptibility to bunt is recessive in this cross, and that resistance probably is governed by multiple factors. F₄ lines were grown that showed greater resistance to bunt than the resistant Oro parent, indicating that the susceptible Tenmarq may carry a factor or factors for resistance to bunt.

The inheritance of resistance to leaf rust (*Puccinia triticea*) was studied only in the F₄ generation. There was transgressive segregation, indicating that factors for resistance to leaf rust probably are present in both parents. No association has been observed between resistance to bunt and resistance to leaf rust, nor between agronomic characters and resistance to either disease.—(*Courtesy Biol. Abs.*)

The role of damping-off diseases in relation to failures of alfalfa stands on some acid soils. W. F. BUCHHOLTZ (*Science*, 80 (1934), No. 2083, p. 503).—In this contribution from the Iowa Experiment Station, the author reports rather high percentages of damping-off due, apparently, to *Pythium* in 3 acid soils, while much lower percentages were met with on 2 neutral soils. It is suggested that failure of alfalfa stands on some acid soils may be due to the activity of damping-off fungi.

Genetics of resistance to bacterial wilt in alfalfa. R. A. BRINK, F. R. JONES, and H. R. ALBRECHT (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 7, pp. 635-642, figs. 2).—In preliminary cooperative tests conducted by the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry in 1933, alfalfa seedlings of known parentage were inoculated, just before setting in the field, by scraping the roots in a suspension of *Phytophthora insidiosa*. Resistance was found to behave in inheritance as an intergrading character resting, probably, upon a complex genetic basis. A factorial interpretation proved impossible. That wilt-resistant plants may differ markedly in composition, with respect to the genes governing resistance and susceptibility, was shown by the widely divergent proportions of resistant offspring obtained on selfing such individuals. The same appeared true of wilt-susceptible plants. The Hardistan variety comprised a diverse array of plants which, on self-pollination, yielded families varying in number of resistant plants from 0 to 100 percent. The behavior of 95 once selfed Hardistan families suggested that there may be a small inverse correlation between seed production and wilt resistance. The apparent relationship, however, is complex, and the data are by no means conclusive.

Wilt resistance appeared to bear no relationship to the external form of the plant or to winter hardiness. If this conclusion is confirmed, there would

seem to be no insuperable obstacle to the incorporation of wilt resistance into any of the diverse regional types of alfalfa now in use.

From the small sample tested, Grimm alfalfa appeared to be of a genetic composition which permits relatively few wilt-resistant segregates in crosses with highly resistant Turkistans. On the other hand, two similar matings of the Turkistans with Hairy Peruvian gave in one instance 58 percent and in the other 18 percent resistant offspring. A single cross of a resistant Turkistan with a *Medicago falcata* plant gave 54 percent resistant segregates.

Effect of mildew and rust infection on dry weight and respiration of excised clover leaflets. C. E. YARWOOD (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 6, pp. 549-558, figs. 4).—Living excised leaflets of *Trifolium pratense* floated with their dorsal surfaces on 10 percent sucrose solution at 22° C. contained about the same amount of dry matter after 12 days as at the beginning of the experiment. Strictly comparable leaflets inoculated with *Erysiphe polygoni* decreased from 7 to 12 percent in total dry weight, while leaflets inoculated with *Uromyces fallens* increased from 3 to 17 percent in dry weight.

The respiration of excised leaflets floating on 10 percent sucrose in closed flasks in the dark was measured manometrically by the change in pressure when the CO₂ produced was absorbed by KOH, or by gas analysis of small samples removed from the flasks at daily or 2-day intervals. For a total of from 9 to 11 days after inoculation the respiration of mildew inoculated leaflets was from 6 to 79 percent greater, and that of rust inoculated leaflets was from 59 to 152 percent greater than that of uninoculated leaflets. The rate of respiration was less when the respiratory gases were allowed to accumulate than when they were removed. The sulfuring of mildewed and healthy leaflets caused only a slight increase in respiration in both cases, indicating that the increased respiration following mildew infection was due to the effect of mildew on the host rather than to the fungus directly.

As determined indirectly from the amount of CO₂ produced and from the original and final dry weights of the excised leaflets, the uptake of sucrose solution was similar for healthy and mildewed leaflets, but was much greater for rusted than for healthy leaflets.

Morphology and life history of the cotton root-rot fungus in Texas. D. C. NEAL, R. E. WESTER, and K. C. GUNN (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 6, pp. 539-548, pls. 11, fig. 1).—Studies of the ozonium and sclerotial stages of *Phymatotrichum omnivorum* are reported, together with observations on its life cycle in Texas. Comparisons are given of the structure of the hyphae, strands, and sclerotia at various stages of their development. The central portion of both old and young strands was found in some cases to be occupied by from 1 to 3 large septate hyphae, while in others the internal morphology resembled that of true sclerotia. Young sclerotia contained a large central hypha, and it appeared to be mainly by the branching and division of this that the sclerotium was formed. The importance of the sclerotial stage in the perpetuation of the disease in the soil is discussed.

Persistent strands of the cotton root-rot fungus in Texas. H. C. McNAMARA, R. E. WESTER, and K. C. GUNN (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 6, pp. 531-538, pls. 6).—Soil examinations in primary centers of infection in continuous cotton plats and also in from 1- to 5-yr. clean fallows infested with *Phymatotrichum omnivorum* definitely indicated that fungus strands may remain dormant and viable for several years as a carry-over source of infection in the soil in addition to sclerotia. The strands are composed of an outer or cortical layer of irregularly shaped, thick-walled cells surrounding larger elongated septate cells, which give rise to new hyphal growth, usually from the ends of the strands or through a break in the cortical ring.

The relation of fertilizers to the control of cotton root rot in Texas, H. V. JORDAN, P. R. DAWSON, J. J. SKINNER, and J. H. HUNTER (*U. S. Dept. Agr., Tech. Bul. 426 (1934), pp. 76, figs. 37*).—A progress report is presented of the results of field experiments on the relation of fertilizer usage to the control of *Phymatotrichum omnivorum* on cotton, conducted in the black-land prairie section of Texas during the period 1928–31. The tests were cooperative between the U. S. D. A. Bureau of Plant Industry, the Texas Experiment Station, and cotton growers. They covered the most prevalent soil types and climatic variations of the section.

Fertilizer analysis experiments, based on the triangle system, with applications of mixtures containing a total of 15 percent of plant food at the rate of 600 lb. per acre (in some instances 300 lb.), were carried out on 8 or 9 soil types, mostly for a period of 2–4 yr. in each case. Detailed results are presented.

In general, the greatest fertilizer response in acceleration of maturity and increased yield was secured from the combined application of nitrogen and phosphoric acid. Only in a few cases did nitrogen alone give greatest increase in yield. A few fields responded to phosphoric acid alone. There was little response to potash. An appreciable residual and cumulative effect of fertilizers was found.

Concentrated fertilizer materials, particularly the ammonium phosphates, showed marked effectiveness in accelerating early plant growth and maturity in certain seasons, but the results were not entirely consistent and did not demonstrate the anticipated advantages over ordinary commercial materials.

None of the common nitrogen carriers showed decided advantage over others tested. Marked increases in cotton yields were obtained following clean fallow on Wilson clay, which materially compensated for the loss of crop during the period of fallow.

Nitrogenous fertilizers applied after sorghum resulted in increased cotton yields sufficient to offset the unfavorable sorghum aftereffects and provide a further increase. Evidence shows the importance of acceleration of maturity usually effected by favorable fertilizers for evading losses due to progressive killing by root rot. Field increases also usually more than compensate for the losses from the disease. A significant reduction in the proportion of cotton killed by root rot was demonstrated where fertilizer treatments were effective.

In view of the results already obtained, the authors hold that there is a possibility that the cumulative effect of optimum fertilization, combined with crop rotation, fallowing, modified tillage, and other cultural treatments, may eventually lead to the eradication of the disease from fields so handled.

Cotton root-rot investigations (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1934, pp. 40, 41*).—Results of experiments on the relation of soil-fertility factors and the use of fertilizers to the control of cotton root rot are briefly noted.

Wound infection and tissue invasion by Plasmodiophora brassicae, R. H. LARSON (*Jour. Agr. Res. [U. S.], 49 (1934), Nos. 7, pp. 607–624, figs. 8*).—In studies at the Wisconsin Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, evidence was gathered concerning wound infection and host tissue reaction of cabbage and crucifers to the clubroot organism. The essential features of the normal and pathological anatomy of these plants are discussed. The manner in which the parasite became distributed in the cabbage root tissues proved to be unlike that found in the upper stem regions. Spheroid galls instead of spindle shape clubs developed on the upper stem and only at uncallused wounds, or where adventitious roots ruptured the tissues. Clubroot attack on underground organs of radish and turnip was confined to the areas where secondary roots emerged.

On the resistance of crucifers to clubroot (*Plasmodiophora brassicae*) [trans. title], E. ROCHLIN (*Phytopath. Ztschr.*, 5 (1933), No. 4, pp. 381-406, figs. 7).—Mounts of living young roots from plants grown in infested soil and stained sections showed that the swarm spores of *Plasmodiophora* pass directly through the walls of the root hairs and epidermal cells, which swell at such points and undergo a chemical change so that they do not stain with chlor-zinc-iodide. The anatomical structure of the root did not seem to have any relation to susceptibility, except for the fact that in mature plants the periderm and collenchyma, as well as the compact xylem, somewhat interfere with the penetration or spread of the parasite. A table listing 56 host species and varieties belonging to 22 genera of the Cruciferae shows the percentages of disease recorded in soil infection experiments in comparison with the presence in the roots of characteristic glucosides. A very close relationship is indicated between resistance to clubroot and the amount present in the plant of those glucosides which, like sinigrin, yield highly pungent mustard oils through the action of myrosin.

It is suggested that more resistant types of cultivated crucifers might be obtained by crossing varieties possessing little resistance with those containing the glucosides constituting the so-called "protective factor."

On the absence of susceptibility to *Plasmodiophora brassicae* Wor. in Cruciferae, E. J. ROKHLINA (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect.)*, *Phytopath.*, No. 3 (1933), pp. 8-31, pls. 2, figs. 7; *Eng. abs.*, pp. 27, 28).—This describes the studies above noted.

Potato virous diseases in 1933, D. FOLSOM (*Amer. Potato Jour.*, 11 (1934), No. 9, pp. 235-242).—This is another brief annual summarization by the author (E. S. R., 71, p. 496) of the contributions to the literature in this field, 133 of which are listed.

A masked strain of tobacco-mosaic virus, F. O. HOLMES (*Phytopathology*, 24 (1934), No. 8, pp. 845-873, figs. 5).—"A completely masked strain of tobacco mosaic virus, possessing many properties of the ordinary distorting, field-type virus, was studied in comparison with a typical mild-mottling strain and with the distorting strain from which it appeared to have been derived. Mixtures of the distorting strain and the masked and mottling type attenuated strains could be distinguished with ease from single-lesion, presumably pure, stocks of the distorting strain when as little as 1 percent of the admixed type was present. It was shown that stocks of distorting-strain virus, acting as though not containing admixtures to this extent and presumed to be entirely free from attenuated strains, remained free from such detectable admixtures of mild-mottling types in plants and in frozen juice for considerable periods of time. Small inoculations of such stocks of distorting-strain virus into healthy stem tissues incubated at temperatures a little above 34° C. gave rise frequently to attenuated strains. The evidence points to the appearance of new and stable strains from the old stock.

"The differences found between the original and the derived strains were few in comparison with their common properties. The masked, mottling, and distorting strains were similar in host range, approximate thermal death point, ability to remain infective after long storage, infectivity in undiluted and diluted juices, production of necrotic primary lesions identical in size, form, and general appearance in certain hosts, and starch-retention patterns in inoculated leaves of certain other hosts. The strains differed principally in two respects. The attenuated strains were able to increase in host tissues at temperatures high enough to inhibit multiplication of virus of the original distorting strain. They caused less chlorosis in the mottling patterns and ap-

peared to involve tissues near the growing point later than did the typical distorting-type tobacco mosaic virus."

Bacterial blight of carrot, J. B. KENDRICK (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 6, pp. 493-510, figs. 8).—This contribution from the California Experiment Station at Davis deals with the bacterial leaf spot and umbel blight of carrots, first found in 1931 in root beds and seed fields in the Sacramento Valley and which has recurred in succeeding years. Irregular necrotic spots are produced on the leaves and involucre bracts, dark brown streaks on the petioles, peduncles, and stems, and blighting of a portion or all of the flowers in the umbels. The main damage results from the destruction of the seed umbels and consequent loss in seed yield.

The disease is caused by an apparently undescribed bacterium with polar flagella, which forms yellow colonies. This organism is designated as *Pseudomonas (Phytomonas) carotae* n. sp., and the chief morphological and cultural characteristics are given. In infection tests the incubation period was never less than 10 days.

Soil infestation may be a source of infection, since the disease has been found in root-bed plantings from seed on soil in which a diseased crop was grown the previous year. The prevalence of floral infection insures seed contamination, and observational evidence in the root beds suggested the seed as the primary source of the disease. Greenhouse tests failed to confirm this, but outdoor tests with artificially contaminated seed resulted in from 5 to 7 percent of infected seedlings.

Weather conditions associated with seasons of severe and slight celery early-blight epidemics in Florida, F. L. WELLMAN (*Phytopathology*, 24 (1934), No. 8, pp. 948-950).—*Cercospora apii* was observed to be very severe in its attack on celery around Sanford, Fla., in the winter of 1931-32, but very slight in attack in 1933-34. The differences in the amount of rain or temperature variations indicated in the weather reports were not sufficient to explain the great differences in severity of early blight. The most extreme difference between the two seasons was in the amounts of heavy fog and dew. In 1931-32 frequent east winds off the ocean induced fogs and dew, whereas in 1933-34 frequent dry northerly winds kept the region comparatively free from them.

Identification of celery virus 1, the cause of southern celery mosaic, F. L. WELLMAN (*Phytopathology*, 24 (1934), No. 7, pp. 695-725, figs. 6).—A study was made of the properties and effects of this hitherto undescribed virus, using a wide range of host plants and comparing it with ordinary tobacco mosaic, common cucumber mosaic, tobacco ring spot mosaic, and the latent or healthy potato mosaic (tobacco mottle).

The southern celery mosaic (celery virus 1) proved filtrable through a Berkefeld "W" filter; was destroyed by heating 10 min. at 75° C.; was not destroyed by freezing; retained its infective power in plant juices diluted with water at rates from 1:500 up to 1:10,000, and occasionally 1:100,000, depending on conditions; withstood aging in vitro 2 days at 28° and 6-8 days at 18°-20°; remained infective when held frozen 14 days; withstood drying on cloth between 3 and 5 days; was destroyed within 1 day in leaves dry enough to crumble; withstood 50 percent ethyl alcohol 15 min.; was destroyed by 15-min. treatment with 1 percent nitric acid, 50 percent saturated solution of hydrated lime, and 10 percent sodium chloride; was transmitted by *Aphis gossypii* and by rubbing plants with infective juice; spread in host plants more rapidly than the viruses of ordinary tobacco mosaic, common cucumber mosaic, or tobacco ring spot; gave rise to no observable abnormal cell-inclusion bodies; proved not to be the same as the mosaic on celery described by Poole (E. S. R., 50, p. 747), Elmer (E. S. R., 53, p. 747), and Harvey (E. S. R., 54, p. 137), which

was probably due to the common cucumber mosaic virus; and was shown to have a wide host range, having been transmitted to 23 species in 8 families of plants, including both monocots and dicots.

A systematic description is given of the known properties of the virus and of the symptoms produced by it on certain differential hosts. This virus has been the cause of increasing damage for over 10 yr. in Florida, causing serious losses not only in celery but in squashes, cucumbers, and peppers. It has been reported also from California, Wisconsin, Ohio, and New York. In Florida the principal wild host is a southern weed, *Commelina nudiflora*.

Isolation and study of some yellow strains of cucumber mosaic, W. C. PRICE (*Phytopathology*, 24 (1934), No. 7, pp. 743-761, figs. 6).—Tobacco plants infected with the cucumber mosaic virus frequently develop bright yellow spots from which different but closely related strains of the virus may be isolated. Evidence was obtained to show that such strains of the virus arise by mutation or a similar process in tobacco plants having the cucumber mosaic disease. They may arise in primary lesions, as well as in systemically diseased leaves of affected plants. One of the strains of the virus isolated from the bright yellow spots was found to yield additional strains on subinoculation. These strains of the cucumber mosaic virus produced necrotic primary lesions in cowpeas but did not become systemic in this host, except for one strain obtained on serial passage through such necrotic lesions which caused a systemic mottling disease in cowpeas. This suggests that viruses capable of producing systemic disease in entirely new host plants may arise under natural conditions.—(*Courtesy Biol. Abs.*)

Control of the Verticillium wilt of eggplant, E. F. GUBA (*Phytopathology*, 24 (1934), No. 8, pp. 906-915, figs. 2).—In studies conducted by the Massachusetts Experiment Station at Waltham, no varieties or types of eggplant (*Solanum melongena*) were found to show resistance to the causal organism. The optimum temperature for growth of the fungus and for infection was found to be about 77°-78° F. Black paper mulch increased soil temperature and added to the earliness and prevalence of the disease in the field.

In pot tests with aluminum sulfate added to naturally contaminated soil, no wilt infection developed at any soil pH below 5.0 and no impairment of plant growth above pH 4.8. In similar tests where inoculated sulfur was added to the soil, excellent control was obtained at soil pH of 4.0-4.2, but growth was impaired in soil with a pH of 3.7-4.0. Three years' efforts to obtain field control by methods in which these findings were put into application resulted in failure to reduce infection adequately without injuring eggplant growth at the same time.

Freedom from wilt was consistently noted, however, where eggplant was grown on old sod land. The use each year of new areas of old sod land is therefore advised as the only practical means of controlling the disease.

Deterioration of color, odor, and the other qualities of hops [trans. title]. [C.] BLATTNY (*Ochrana Rostlin*, 13 (1933), No. 3-4, p. 144).—Damage present after 3 yr. of storage is described. Less spoilage was found in hops from bordeaux-sprayed yards than in hops from unsprayed yards.

A leaf, stem, and pod spot of pea caused by a species of Cladosporium, W. C. SNYDER (*Phytopathology*, 24 (1934), No. 8, pp. 890-905, figs. 3).—This contribution from the California Experiment Station describes this disease of *Pisum sativum*, which was found most abundantly in certain coastal areas of California. Necrotic tan spots, roughly circular to irregular and delimited by a narrow line of dark brown, were produced on the foliage. Stem lesions were dark brown to black and of varying shapes. Pod infection resulted in

the formation of dark brown to black, sharply defined scabs of irregular shape. Hairlike proliferations of the inner pod membrane, resulting in white felty patches, were induced by the presence of the fungus in the pod, as well as by other causes.

The name *C. pisicolum* n. sp. is proposed for the pathogen. The branchingly catenulate, light brown conidia measure about 4.4μ by 8.7μ for the smaller, usually continuous ones, and reach a length two or three times greater for the larger basal ones, which are usually continuous but sometimes 1, or rarely 2, septate.

Under favorable conditions of high humidity and moderate temperature, foliage infections occurred within from 3 to 7 days following inoculation. Only the young growing tissues were susceptible. All varieties of *P. sativum* tested proved susceptible to infection in varying degrees. Cowpea, sweet pea, and the asparagus bean were not found susceptible. Observations and tests indicated that blighting of seedlings may occur in soil infested with vine refuse from a previous diseased crop, or through seed-borne infections.

A new wilt of peas, L. L. HARTER (*Phytopathology*, 24 (1934), No. 8, pp. 950, 951).—Wilting of peas associated with other *Fusaria* than *Fusarium orthoceras pisi*, the typical pea wilt organism, has been found widely distributed in the United States. The two forms most frequently isolated from the strongly red vascular bundles in the lower portions of affected plants have been identified as probably *F. oxysporum aurantiacum* and *F. vasinfectum lutulatum*. Typical symptoms were reproduced when peas were grown in sterilized soil profusely inoculated with both organisms. A third species, probably *F. redolens*, was isolated in a few cases.

Probable occurrence of Australian spotted wilt of tomatoes in Wisconsin, S. P. DOOLITTLE and C. B. SUMMER (*Phytopathology*, 24 (1934), No. 8, pp. 943-946, fig. 1).—In July 1930, a streak disease of tomatoes occurred in the greenhouses of the Wisconsin Experiment Station which, on the basis of symptoms, appeared to be identical with that produced by the virus of Australian spotted wilt. The young leaflets showed typical bronze markings, and the fruits were marked with the concentric rings which characterize the Australian disease. The virus was transmitted by leaf rubbing and stem punctures, and typical symptoms were secured. Owing to abnormally high greenhouse temperatures in September, the diseased plants died before further infection could be secured, and only limited studies were made on the host range and properties of the virus, although it was transmitted to tobacco and was shown to live less than 48 hr. in vitro. Tomatoes planted on the same land in 1931 did not develop the disease.—(*Courtesy Biol. Abs.*)

Relation of fire blight to honey bees, H. R. ROSEN (*Missouri State Hort. Soc. Proc.*, 1931-32, pp. 67-77).—This problem is discussed popularly in the light of the author's researches (E. S. R., 69, p. 674).

Penetration, distribution, and effect of petroleum oils in apple, P. A. YOUNG (*Jour. Agr. Res.* [U. S.], 49 (1934), No. 6, pp. 559-571, pls. 2, fig. 1).—In this work at the Montana Experiment Station, oils sprayed or brushed onto the surface of leaves of *Pyrus malus* were found to pass readily from the leaves into the twigs, becoming widely distributed in and between the parenchyma cells, and in the tracheae of leaves and twigs. Oil was found in an apple stem 488 days after spraying the leaves. Petroleum oils with viscosities of from 50 to 108 sec. [Saybolt] penetrated the under surfaces of the leaves through the stomatal orifices and made translucent spots within from 2 to 60 sec. Oils injected into apple limbs were found from 9 to 12 mo. later, 5-88 cm distant, mainly in the tracheae of annual rings connected with the

points of injection. Drops of oil placed on apple fruits penetrated through the lenticels and passed between the parenchyma cells.

The main symptoms caused by oils of different degrees of toxicity in apple leaves and branches are described. The toxic effects were found to depend mainly, but not exclusively, upon the percentage of sulfonatable residue. The author holds that the rapidity, severity, and abundance with which symptoms of injury appeared indicated the toxicity of each kind of oil, and that the probable injurious effects of an oil can be tested before it is used.

A rot of pears due to a discomycete (*Phacidiella discolor*) [trans. title], J. BARTHELET (*Min. Agr. [France], Ann. Épiphyties*, 19 (1933), No. 6, pp. 357-368, pls. 3, figs. 8).—This is the first report of the occurrence in France of this pear branch canker and storage dry rot producing fungus. The fruits were invaded at the apparently unwounded stem ends, and the affected exterior became blackened. Diseased pears placed in a moist chamber became covered with grayish, pyriform pycnidia. The fungus is described and its fruiting structures figured.

[Zinc] sulphate treatment for cherries, O. T. McWHORTER (*Better Fruit*, 29 (1934), No. 5, p. 4).—Almost complete present recovery of sweet cherry trees in Wasco County, Oreg., from a serious "little leaf" or "rosette" condition is reported following the insertion of zinc sulfate into holes bored with a small auger about 4 in. apart in a ring around the trunks just under the ground line, in tests during two seasons. The author is not convinced, however, that this condition is due merely to zinc deficiency, since affected trees sometimes appeared to recover without any conceivable improvement in the zinc supply and since annual plants grown in the same soils were generally free from little leaf symptoms.

Mosaic of the American grape [trans. title], V. VIELWERTH (*Ochrana Rostlin*, 13 (1933), No. 3-4, pp. 83-90; *Ger. abs.*, pp. 89, 90).—In a collection of American grape stocks of 17 varieties growing at Bratislava, Czechoslovakia, symptoms of a mosaiclike disease made its appearance. A description is given, and the severity of attack on the different varieties is noted. It was found to be transmissible by grafting to 2 European grape varieties.

Is the grape mosaic produced by a single virus? [trans. title], C. BLATTNÝ (*Ochrana Rostlin*, 13 (1933), No. 3-4, pp. 104-115, figs. 5; *Ger. abs.*, pp. 114, 115).—Inoculation studies extending over three seasons on grapes of different varieties, including European and American types, indicated that the central European mosaic is not transmissible to American varieties. In one European variety it took a latent form. On the basis of tests, this virus disease is considered distinct from roncet.

Life history and control studies for melanose and scab of citrus, G. D. RUEHLE (*Citrus Indus.*, 13 (1932), No. 10, pp. 8, 27, 34).—This contribution from the Florida Citrus Experiment Station gives a popular discussion of existing knowledge about these diseases and the results of control experiments.

Experimental production of crown gall on *Opuntia*, M. LEVINE (*Phytopathology*, 24 (1934), No. 8, pp. 929-937, figs. 6).—*O. keyensis*, inoculated with a virulent strain of *Bacterium tumefaciens* in late summer and kept at moderately low temperatures during the winter, produced swellings by the following January which reached the size of a black walnut a year after inoculation. The galls showed a disoriented conglomeration of cells consisting of fibrovascular elements, clusters of embryonic cells, and parenchymatous tissue surrounded by fragments of epidermis and bark, and also showed a number of definitely organized structures in the periphery that appeared to be embryonic roots. In other species of *Opuntia*, inoculation has thus far resulted only in injury and death of the tissue without tumor formation.

Practical results of recent investigations on the beet and oats nematodes [trans. title], H. GOFFART (*Mitt. Deut. Landw. Gesell.*, 48 (1933), No. 47, pp. 1029, 1030).—In a popular discussion, the author calls attention to the fact that the beet nematode and the oats nematode are different races of the same species (*Heterodera schachtii*) and that it is, therefore, unnecessary to eliminate oats or other susceptible grains from the rotation with beets. An effective system of crop rotation is outlined for the practical elimination of damage from this type of nematode.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1934, J. N. DABLING (*U. S. Dept. Agr., Bur. Biol. Survey Rpt.*, 1934, pp. 1-13, 14-32).—The work of the year here reported (*E. S. R.*, 70, p. 498), in addition to that noted on page 522, includes data from a comprehensive study of waterfowl; mountain sheep-merino crossbreeding experiments; influence of mice and snowshoe rabbits on forest reproduction, and of foxes on rodent control; beaver and deer transplantings; musk ox studies; wild-fowl food resources; field investigations of injurious birds; field studies of the food of the armadillo; importance of fur as a natural resource; methods of feeding foxes; studies of color inheritance of fur animals; marten breeding experiments; muskrat investigations; relationship of tularemia and other diseases to wildlife populations; disease control by suppression of carriers; and research on control methods, chiefly by poisoning.

Synoptic summary of the principal legislative measures concerning bird protection: Europe (January 1932) (*Synopsis des principales mesures législatives concernant la protection des oiseaux: Europe (Statut en Janvier 1932)*). *Bruxelles: Off. Internatl. Protect. Nature*, 1933, pp. 8+[28].—This synopsis, issued from the International Office for the Protection of Nature, summarizes the measures in force in Europe and North Africa as of January 1932. The presentation is in tabular form.

The life of the rook, G. K. YEATES (*London: Philip Allan*, 1934, pp. 95, pls. 16, figs. 2).—A popular account of one of the most ubiquitous birds in the English countryside.

Handbook of frogs and toads: The frogs and toads of the United States and Canada, A. A. and A. H. WRIGHT (*Ithaca, N. Y.: Comstock Pub. Co.*, 1933, pp. XI+231, figs. [89]).—Descriptive accounts of the frogs and toads of the United States and Canada are accompanied by photographic illustrations. Keys for their identification and a bibliography of 15 pages are included.

Technique of field experimentation in entomology.—I, Some principles involved in a well-planned experiment, L. L. HUBER and J. P. SLEESMAN (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1166-1170).—This contribution from the Ohio Experiment Station summarizes "some of the more important concepts which the economic entomologist should constantly keep in mind."

The digestion of wood by insects and the supposed role of micro-organisms, K. MANSOUR and J. J. MANSOUR-BEK (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc.*, 9 (1934), No. 4, pp. 363-382).—Following a historical discussion, the occurrence of intracellular micro-organisms in wood-eating insects and the supposed role of such micro-organisms, the occurrence of extracellular intestinal micro-organisms in some wood-eating insects, and experimental work on the digestion of different components of wood by insects are considered. The account is accompanied by a list of 83 references to the literature.

The site of loss of water from insects, K. MELLANBY (*Roy. Soc. [London], Proc., Ser. B*, 116 (1934), No. B797, pp. 139-149, figs. 6).—A description is given

of an apparatus which will measure the amount of water evaporated from an insect, accurate to 0.01 mg. "The rate of loss of water from three species of insects was determined, first in dry air, then in air to which 5 percent of carbon dioxide had been added, and thirdly in a mixture containing under 1 percent of oxygen. In insects with a spiracle-closing mechanism, the rate of loss of water under the second two conditions (which caused them to keep their spiracles open permanently) was 2 to 7 times that in dry air. In insects which could not close their spiracles, the rate of loss of water was practically the same under all conditions. It was found that 2 percent of carbon dioxide in the air was sufficient to cause insects to keep their spiracles permanently open, and that the oxygen had to be reduced below 1 percent to have the same effect.

"From these experiments it appears that practically all the water evaporated from an insect is lost by way of the tracheal system, and that a thin integument may be just as watertight as one which is highly 'sclerotized.'"

Sudden outbreaks of insect pests, H. F. BARNES (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 260-268, figs. 5*).—This contribution from the Rothamsted Experimental Station reports upon (1) estimation of insect populations by (a) direct sampling and counting and (b) trapping insects and (2) avoidance of epidemics of insect pests under the titles (a) the choice of suitable soil and position for the plant, (b) the use of resistant and immune varieties of plants, and (c) the suppression of alternative host plants of the pest.

[**Notes on economic insects and their control**] (*Jour. Econ. Ent., 27 (1934), No. 6, pp. 1196-1198*).—The notes here contributed (E. S. R., 72, p. 357) are as follows: The Box Elder Bug in New York, by C. R. Crosby (p. 1196); The Sex Ratio of *Macrocentrus ancylivorus* Roh., by J. K. Holloway (p. 1196); Birds as Predators of the Beet Leafhopper, by G. F. Knowlton, J. S. Stanford, and C. F. Smith (pp. 1196, 1197), contributed from the Utah Experiment Station; *Sitotroga* Production, by S. E. Flanders (p. 1197), contributed from the California Citrus Experiment Station; An Unusual Outbreak of Stable Fly and Its Control, by W. C. Nettles (pp. 1197, 1198); and Dolichopodidae [*Dolichopus ramifer* Loew] in a Greenhouse, by T. D. A. Cockerell.

The historical background of entomology in relation to the early development of agriculture in California, E. O. ESSIG (*Pan-Pacific Ent., 10 (1934), Nos. 2, pp. 49-58, fig. 1; 3, pp. 97-101*).—This is in continuation of the account previously noted (E. S. R., 71, p. 809.)

[**Report of work in entomology by the Missouri Station**] (*Missouri Sta. Bul. 340 (1934), pp. 43, 45-51, 61, 62*).—The work of the year referred to (E. S. R., 70, p. 206) includes that with (1) the use of calcium cyanide in ridding the milking barn of flies and (2) controlling cattle grubs on dairy cows, both by H. A. Herman and G. D. Jones; the codling moth, by L. Haseman, P. H. Johnson, Jones, L. Jenkins, H. Koch, and H. O. Ezell; hessian fly resistant varieties of wheat, by Haseman, Jones, and Koch; control of buttoning of strawberries due to the tarnished plant bug, by Johnson and Haseman; repellents for blood-sucking flies on livestock and control of ox warbles, both by Haseman, Johnson, and Jones; insect pests of melon and related crops, by Haseman; methods of controlling the chinch bug, by Haseman and Jones; and substitutes for arsenical sprays for the codling moth and the cabbage worm, by T. J. Talbert, H. G. Swartwout, and C. G. Vinson.

[**Work with economic insects at the Wisconsin Station**] (*Wisconsin Sta. Bul. 428 (1934), pp. 97-109, figs. 2*).—Findings as to the control of white grubs are noted, as based on studies by C. L. Fluke and P. O. Ritcher as to the 12 species in the 1933 flight; by Ritcher and H. L. Ahlgren as to the favorable effect of shallow soils; as to the failure of fertilizers to control grubs; by G. B.

Mortimer, Ahlgren, and E. J. Graul as to the lower grub count in regularly grazed pastures; as to soil treatments and insecticides tested in the eradication of grubs and their insect enemies; and by L. F. Graber as to the successful cultivation of legumes. J. H. Lilly and Fluke found that lime-sulfur controls the cherry casebearer on apples, and M. H. Doner identified eight additional cherry casebearer parasites. H. F. Wilson, G. E. Marvin, and E. C. Alfonsus report that low and constant temperatures prevent fermentation of honey in storage; M. H. Haydak found rye flour inadequate as a pollen substitute; and Wilson and Alfonsus state that due to drought the honey flora of the State has almost completely changed during the past 5 yr. and that excess moisture in winter stores is the cause of bee dysentery. It was found by T. C. Allen that rotenone dust is effective against the cabbage worm, by Fluke and C. L. Kuehner that bait traps permit proper timing of codling moth spray, by Allen that a new petroleum and pyrethrum spray simplifies potato leaf hopper control, and by E. M. Searls, Graber, and V. G. Sprague that delayed cutting of alfalfa is the best protection against alfalfa yellows (E. S. R., 71, p. 72).

Report of the entomologist, C. SMEE (*Nyasaland Dept. Agr. Ann. Rpt.*, 1933, pp. 46-53).—This contribution relating to the work of the year (E. S. R., 70, p. 803) deals entirely with locusts, the Protectorate having been affected by the development and spread of the red-winged species *Nomadacris septemfasciata* Serv. following invasion by the hairy-chested species *Locusta migratorioides* R. & F.

Investigations on the insect and allied pests of cultivated mushrooms, II, III, M. D. AUSTIN and S. G. JARY (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34* (1934), pp. 70-86, figs. 9).—In this further contribution (E. S. R., 71, p. 810) part 2 deals with a survey of the incidence of mushroom pests present on commercial beds (pp. 70-74) and part 3 with the natural fauna of stable manure used in the preparation of mushroom beds (pp. 74-84).

Field observations on some Guiana insects of medical and veterinary interest, J. G. MYERS (*Trop. Agr. [Trinidad]*, 11 (1934), No. 11, pp. 279-283).—The author reports upon observations made in the course of journeys in the interior of northern South America.

The control of certain household pests with poison bran bait, E. I. McDANIEL (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 2, pp. 67-71, figs. 5).—A brief account of the place of poison bran bait in combating household pests.

[Insecticide investigations] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt.*, 1934, pp. 7, 8, 26-29).—The work of the year reported upon (E. S. R., 70, p. 501) includes that with nicotine for codling moth control, toxicity of rotenone derivatives, use of products derived from derris and cube, miscellaneous fish-poisoning plants, physical properties of anabasine, synthetic compounds containing sulfur, spray residues, fluorine-containing insecticides, grain fumigants, sulfur for mushroom fumigation, and methyl thiocyanate fumigation of scale insects.

[Lists of United States patents relating to insect traps], compiled by R. C. ROARK (*U. S. Dept. Agr., Bur. Chem. and Soils, Pat. Lists*, 1934, Nos. 13, pp. 5; 14, pp. [9]; 15, pp. [5]; 16, pp. 8; 17, pp. [4]; 18, pp. 16; 19, pp. 10; 20, pp. 21; 21, pp. [23]; 22, pp. 6; 23, pp. 5; 24, pp. 3; 25, pp. 22; 26, pp. 4).—These further lists of United States patents issued from 1917 to 1933, inclusive (E. S. R., 71, p. 814), relate, respectively, to fly exits for screens, devices for catching insects with adhesives, compressible insect powder dusters, fly swatters, screen door shoo-fly attachments, bollweevil machines, antivermin poultry roosts, fumigating devices, apparatus for applying insecticidal dusts, poison bait holders,

fly nets and red canopies, apparatus for destroying insects by heat, apparatus for combating insects on animals, and spring operated insect killers.

The synergistic effect of the chlorides and bicarbonates of potassium and sodium upon the paralytic action of nicotine in the cockroach, N. D. LEVINE and C. H. RICHARDSON (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1170-1175, fig. 1).—In the work here reported, in which the American cockroach was used as the test insect, injections were given of nicotine solutions of various concentrations made up in (1) M/10 potassium chloride, (2) M/10 potassium bicarbonate, (3) M/10 sodium bicarbonate, (4) M/10 sodium chloride, and (5) distilled water (the control). "Ten roaches were usually treated with each concentration of nicotine in each solvent. The concentrations of the nicotine solutions ranged from 0.01 percent (grams per 100 cc) down to one from which no effect was observed. For distilled water and sodium chloride, this concentration of nicotine was 0.001 percent; for sodium bicarbonate, 0.0005; for potassium bicarbonate, 0.0004; and for potassium chloride, 0.0001 percent. Other controls were also injected with solutions of the salts alone. In the case of the potassium bicarbonate solution, a slight effect was observed in 3 roaches, but there was none with the solutions of the other salts."

The effects of different salts upon the toxicity of nicotine are reported in chart form. It appears that "nicotine alone produced an effect on the roaches in a concentration of 0.002 percent, but not lower. At 0.01 percent complete paralysis was produced which lasted, on the average, about a quarter of a minute. At all lower concentrations the mean effect was incomplete paralysis, until, at 0.001 percent, no effect was manifest."

Insecticidal tests of synthetic organic compounds—chiefly tests of sulfur compounds against culicine mosquito larvae, F. L. CAMPBELL, W. N. SULLIVAN, L. E. SMITH, and H. L. HALLER (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1176-1185).—The results of initial tests of synthetic organic compounds against mosquito larvae; comparative tests against mosquito larvae of the more toxic organic compounds containing sulfur, concentration 1:40,000, 50 larvae per test; relative effect against mosquito larvae of aqueous suspensions of slightly soluble sulfur compounds and clear filtrates of the same concentration of suspensions, 1:40,000, 50 larvae per test; comparative tests against mosquito larvae of the more toxic organic compounds containing sulfur v. rotenone, 50 larvae per test; and relative value of four organic compounds tested in the laboratory against 5 species of insects are reported in tabular form.

"Of 68 synthetic organic compounds, the majority of which were sulfur compounds, 24 were found to equal or exceed nicotine in effectiveness against culicine mosquito larvae. Diphenylene oxide and diphenylene sulfide were the most effective of these compounds, killing nearly 100 percent of the larvae in 5 hr. at 1:200,000. In the course of the work 2 new compounds were prepared, *p*-hydroxyphenylacetimido-thiophenylether hydrochloride and phenylacetimido-thio-*p*-tolylether hydrochloride. The latter was probably the most toxic of the 7 thioethers that were tested. It was effective against mosquito larvae at 1:100,000."

In later tests the compound most toxic to these larvae was thiodiphenylamine (phenothiazine), which is more toxic than rotenone, being very effective at a concentration of 1:1,000,000.

Organic thiocyanogen compounds as insecticides, A. HARTZELL and F. WILCOXON (*Contrib. Boyce Thompson Inst.*, 6 (1934), No. 3, pp. 269-277, fig. 1).—The authors report upon a preliminary study made of the toxicity of 15 organic thiocyanogen compounds when used as spray materials for the bean aphid on nasturtium. "The compounds used included both aliphatic and aromatic compounds of various types. Several of the compounds exhibited

marked toxicity to *Aphis rumicis* at the concentration used (0.1 percent), much greater than that of the corresponding halogen compounds. In several cases injury to nasturtium plants was noted. When injury and toxicity are considered, the most satisfactory compound was γ -thiocyanopropyl phenyl ether. This compound was further tested on [citrus] mealybug (*Pseudococcus citri*) and red spider mite [common red spider] (*Tetranychus telarius*), giving excellent control. Out of 20 species of plants sprayed with this compound at a concentration of 0.1 percent, only buckwheat showed injury. Observation of the symptoms produced on the [American] cockroach (*Periplaneta americana*) by this compound indicated that it possessed the properties of a paralytic agent. Nerve lesions were noted in [yellow] meal worm larvae (*Tenebrio molitor*) that had been killed by γ -thiocyanopropyl phenyl ether applied externally following a technic used in the detection of paralysis, involving the use of toluidine blue. Death is caused apparently by injury to the central nervous system accompanied by paralysis."

A list is given of 20 references to the literature.

Devil's shoestring (*Cracca virginiana* L.), a potential source of rotenone and related insecticides, R. C. ROARK (*U. S. Dept. Agr., Bur. Chem. and Soils, 1934, pp. 12*).—The roots of certain specimens of the leguminous plant *C. virginiana*, known by many common names, of which devil's-shoestrings is used, and which has been found in sandy soil in eastern Texas, have been shown to possess insecticidal value against some insects equivalent to that of pyrethrum and nearly equivalent to that of derris. Rotenone, in amounts ranging from 0.1 to 1 percent, tephrosin, and related compounds have been isolated from the root of this plant. The total material extractable with acetone is said to range as high as 9 percent. It is believed that by selection and breeding of toxic strains the content of insecticidal constituents in this plant can be greatly increased, and that the possibility of its becoming an insecticide of commercial importance is excellent. See also other notes (E. S. R., 65, p. 846; 70, p. 501).

A list is given of 64 references to the literature.

Studies of contact insecticides, VIII, W. C. O'KANE and W. C. BAKER (*New Hampshire Sta. Tech. Bul. 60 (1934), pp. 12, figs. 4*).—In part 1 (pp. 1-7) of the present contribution (E. S. R., 71, p. 814) the authors consider a technic for tracing the penetration of petroleum oil into insect eggs. It is pointed out that two procedures may be followed in endeavoring to trace such penetration, (1) an unstained oil may be applied to the egg, the sections cut, and then stain applied in such way as to make visible any globules of petroleum oil present within the sections, and (2) a stained oil may be used, the sections cut, and such subsequent treatment given as will differentiate any petroleum oil present. Both procedures were employed in the present study, each serving in effect as a check on the validity of the other. Part 2 (pp. 7-12) reports upon some determinations of oil penetration into insect eggs.

In this work four staining methods were used to trace the penetration of petroleum oil into the eggs, the American cockroach and a grasshopper of the genus *Chortophaga* being employed. Three of these methods involved "staining after the eggs had been fixed with Bouin's solution and sectioned by the freezing method. The stains used were (1) osmic acid-oil red O, (2) the Rohrbaugh stain of Nile blue sulfate-oil red O, and (3) osmic acid-Nile blue sulfate-oil red O, which was a combination of the first stain devised and the Rohrbaugh stain. To verify the results obtained by staining after the eggs had been sectioned, a fourth method of treating the eggs was employed in which they were treated with a nearly saturated oil solution of oil red O and sectioned."

The petroleum spray oil was found to penetrate the eggs of both species. "In sections of the cockroach egg, oil was found in the chorion and as streaks penetrating the parts of the segmenting egg. In sections of the grasshopper egg, oil was found as minute globules scattered throughout the endochorion and as streaks along the body folds of the developing embryo. Bouin's solution was found to be superior to potassium hydroxide as a fixative. Staining with solutions at room temperature was superior to solutions at 8° C."

Studies on the ovicidal action of winter washes—1933 trials, M. D. AUSTIN, S. G. JARY, and H. MARTIN (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34* (1934), pp. 114-135, figs. 3).—Further laboratory tests of the ovicidal efficiency of various tar and petroleum oils on the eggs of the common green capsid *Lygus pabulinus* L. (E. S. R., 71, p. 814) have shown that there are no differences due to the variety of currant in the action of the oils on eggs laid in twigs of Fay Prolific and Versailles.

"No relationship was found between ovicidal properties and the characteristics of 21 petroleum oils of paraffinic, asphaltic, naphthenic, and western bases, of viscosities ranging from 126" to 800" Redwood I at 70° F. and of unsulfonated residues ranging from 60 to 100 percent by volume. The ovicidal efficiency of a tar oil was improved by the removal of tar acids and bases, but treatment for the removal of oxygenated derivatives did not give a tar oil of ovicidal efficiency equal to that of a half-white petroleum oil of a similar boiling range. Evidence was obtained of the lower ovicidal efficiency of petroleum oils of unsulfonated residue below 60 percent by volume, and it is suggested that the inferiority of tar oils as compared to the petroleum oils tested is associated, apart from lower hydrocarbon content and boiling range, with the chemical character of the hydrocarbons present. The relative ovicidal efficiencies of the various petroleum oils examined at 4 percent and at 2 percent show differences unassociated with the characteristics of the oils determined.

"Field trials showed the two-solution oleic acid method of emulsification suitable for the preparation, by the grower himself, of washes containing tar and petroleum oils of specified characteristics. Home-prepared washes containing 3 percent of strained anthracene oil and 4.5 percent of one of four petroleum oils of different characteristics, (1) applied to red currants, equaled in the control of the capsid *L. pabulinus* a wash containing 4 percent of tar oil and 6 percent petroleum oil; (2) applied to black currants, failed to equal the control of *L. pabulinus* given by the 10 percent combined oil wash, except in the case of one petroleum oil (P10a); (3) applied to Worcester Pearmain apples, failed to equal the control of the capsid *Plesiocoris rugicollis* obtained with the 10 percent combined oil wash, except in the case of one petroleum oil (P12a). Marked bud damage was caused by the 10 percent combined oil wash. A home-prepared wash containing 4 percent strained anthracene oil gave an excellent control of the apple sucker (*Psylla mali*), which was equaled by a proprietary wash used at 6 percent. The failure to control apple sucker of two proprietary washes containing, instead of tar oil, a petroleum oil of low unsulfonated residue, was found to be related to the low content of aromatic hydrocarbons in the prepared wash."

Control of mealy bugs and other resistant insects on hardy plants with a completely refined petroleum distillate, J. M. GINSBURG (*Jour. Econ. Ent., 27* (1934), No. 6, pp. 1186-1188).—In the study at the New Jersey Experiment Stations of the effects of paraffin waxes and various petroleum oil distillates on plants, the author found that a completely refined, low-boiling petroleum fraction was noninjurious to a large number of plants when lightly sprayed in pure unemulsified form and showed high toxicity to insects.

Notes on Diplopoda.—III, Short notes on three injurious millipedes recently observed, S. W. ROLFE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34* (1934), pp. 258, 259).—These notes related to *Choneiulus palmatus* (Nemec.) on mushrooms, *Blaniulus guttulatus* (Bosc) on peas, and *Cylindroiulus londinensis caeruleocinctus* (Wood) on strawberries.

Control and prevention of the western subterranean termite, W. B. HERMS (*California Sta., 1934, pp. 4*).—A practical account of *Reticulitermes hesperus* Bks., the most widely spread and probably the most destructive termite in California, including its stages and life, evidences of its attack, methods of repair, methods of prevention, and the question of resistant wood.

Observations on the use of zinc chloride for soil treatment in the control of termites, G. F. HILL and F. G. HOLDAWAY (*Jour. Council Sci. and Indus. Res. [Aust.], 7* (1934), No. 3, pp. 169–172).—The authors found that “termites of the species *Eutermes caitiosus*, a mound-building termite, working in the earth floor of a grain shed appear to have been effectively repelled by the application of zinc chloride solution giving a concentration of approximately $3\frac{1}{4}$ oz. per square foot and a penetration of 1 in. An initial application giving a concentration of $\frac{1}{2}$ oz. per square foot was ineffective. Following an additional application which resulted in the higher concentration, the termites left the treated ground and rebuilt a partially destroyed mound from which they had apparently been working.”

The life-cycle and bionomics of Lipeurus heterographus Nitzsch, F. H. WILSON (*Jour. Parasitol., 20* (1934), No. 5, pp. 304–311, figs. 2).—The author reports having reared the chicken head louse in an incubator under controlled laboratory conditions, with feathers as the only food. “The incubation period of the eggs observed varied between 5 and 7 days. The first instar has a duration of 6 to 14 days; the second instar, 8 to 14 days; and the third instar, 11 to 14 days. The adult appears following the third molt. Adults reared in captivity were mated and laid fertile eggs. Molting and copulation are described in detail. Feeding experiments utilizing feathers, feathers and dried blood, blood alone, and feathers from a host widely separated from the normal host of this mallophagan parasite are described and discussed.”

Grasshopper control pays, R. HUTSON (*Michigan Sta. Quart. Bul., 17* (1934), No. 2, pp. 72–74, fig. 1).—The importance of grasshopper control is emphasized.

A comparison of the life cycles of Frankliniella tritici (Fitch), F. fusca (Hinds), and Thrips tabaci Lind. (Thysanoptera-Thripidae) in South Carolina, J. G. WATTS (*Jour. Econ. Ent., 27* (1934), No. 6, pp. 1158, 1159).—A comparison of the life histories of the flower thrips, tobacco thrips, and onion thrips by the South Carolina Experiment Station shows that the tobacco thrips has the longest life cycle, lays the largest number of eggs per female, and lives the longest in the adult stage, while the flower thrips has the shortest life cycle and lays the least number of eggs per female, but in the adult stage lives slightly longer than the onion thrips.

Gladiolus thrips control studies and observations on bulb mite infestation, F. L. GAMBRELL (*Jour. Econ. Ent., 27* (1934), No. 6, pp. 1159–1166, figs. 2).—In experimental control work with the gladiolus thrips at the New York State Experiment Station during the past season approximately 13,000 corms of the Mrs. Francis King variety were used. The work included corm treatments, insecticides applied in furrow at the time of planting, weekly applications on the surface of the soil, weekly dusts, and weekly sprays. The details of foliage development and mite (particularly the bulb mite) and thrips injury as related to corm and field treatments are presented in tabular form.

Control of gladiolus thrips on stored corms, C. C. HAMILTON (*New Jersey Stas. Circ. 333* (1934), pp. 4).—A brief practical account of the appearance and

development of the gladiolus thrips and its control by fumigation and by dipping.

A note on injury caused by two species of Thysanoptera, S. G. JARY (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 63, 64*).—The author reports injury to a brussels sprouts seed bed by the attack of *Thrips angusticeps* Uzel and to apple by the pear thrips.

The cotton stainer problem, C. B. WILLIAMS (*Empire Cotton Growing Rev., 11 (1934), No. 2, pp. 99–110*).—A review of *Dysdercus* spp. and their relation to the injury to cotton bolls by fungi, contributed from the Rothamsted Experimental Station.

The black pecan aphid and summary of progress toward effective and practical control, G. F. MOZNETTE (*Ga.-Fla. Pecan Growers Assoc. Proc., 27 (1933), pp. 45, 46, 48*).—A brief practical account.

The external anatomy of the Parlatoria date scale (Parlatoria blanchardi Targioni Tozzetti), with studies of the head skeleton and associated parts, F. S. STICKNEY (*U. S. Dept. Agr., Tech. Bul. 421 (1934), pp. 68, pls. 2, figs. 14*).—All the distinguishable structures of the external anatomy of all instars of both sexes, of the head skeleton and associated parts of the adult female, and of the third and fourth male instars are here discussed and figured in detail. It is pointed out that the labeling on the figures presented makes possible a ready comparison of apparently homologous parts through the various instars. A variation in size, position, and occurrence of structures and groups of structures has been found to be characteristic and is frequently noted specifically. Numerous records of the average and range of variation are also given, the number of cases used for each determination ranging from 7 to 2,378.

Relation between the chemical composition of citrus scale insects and their resistance to hydrocyanic acid fumigation, A. R. C. HAAS (*Jour. Agr. Res. [U. S.], 49 (1934), No. 6, pp. 477–492, fig. 1*).—In work at the California Citrus Experiment Station, the composition of various citrus scale insects was studied in relation to the composition of the part of the tree that they infested and also in relation to the resistance of the scale to cyanide fumigation.

It appears that "citrus scale insects accumulate a much greater concentration of a given constituent within themselves than occurs in the portion of the affected host tree. No relation was found between the ability of the insects to resist fumigation and their organic or inorganic iron or (ash) phosphorus content. Citrus scale insects contain considerable copper. A reduced content of copper may be related to fumigation resistance. Among other possible relations brought out by the analyses were those involving the amount of wax and the concentration of reducing substances in the scale insects. A considerable portion of a scale insect consists of material that is soluble in a boiling solution of strong alkali. The concentration of total nitrogen in red scale is considerably higher than that of total sulfur or total phosphorus. The concentration of potassium in the yellow scale [*Aonidiella citrina* (Coq.)] examined was nearly double that in the [California] red scale."

A list is given of 21 references to the literature.

The times of emergence and forms of Pieris rapae at Philadelphia, U. S. A., O. QUEROI (*Ent. Mo. Mag., 3. ser., 20 (1934), Nos. 235, pp. 166–168; 236, pp. 169–175; 237, pp. 213–216; 238, pp. 217–224, fig. 1*).—A continuation of the contribution previously noted (*E. S. R., 69, p. 239*).

The oriental fruit moth in Maryland, H. S. MCCONNELL (*Maryland Sta. Bul. 364 (1934), pp. 411–456, figs. 26*).—In this contribution the author reports upon the morphology, biology, economic importance, and natural and artificial control of the oriental fruit moth in Maryland. First observed in the State at College Park in 1916, the pest has spread to all parts of the State and exacts

a heavy yearly toll from the fruit crops, the greatest loss being to peaches. Quinces are almost a total loss year after year. Only one orchard remains in the State; the others have been pulled out. Apples are attacked severely some seasons, especially when peach plantings are near or peaches and apples are interplanted. The oriental fruit moth attacks quinces and apples late in the season, the attack coming after peach harvest begins, apparently being due to migration of moths.

"Applications of insecticides for control of this pest have not proved to be worth while. The habits of the various stages make it unlikely that insecticides alone will ever be very effective. Since many larvae overwinter in debris beneath the trees and in the ground under the trees, early cultivation will reduce the carry-over to some extent. Large numbers of larvae spin up about packing houses and in picking equipment. Sanitary measures which will prevent moths from reaching the orchards will aid in reducing infestations.

"The principal parasites operating over the entire State are *Macrocentrus ancyllivorus* and *Trichogramma minutum*. *M. ancyllivorus* attacks the larvae and is most effective when the larvae are in twigs. *T. minutum* attacks the eggs and is most effective late in the season. *M. delicatus* and *Glypta ruficinctellaris* are important in some localities."

Improvement in "apple plug" technic for toxicological studies of the codling moth, E. H. SIEGLER, F. MUNGER, and J. B. GAHAN (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1140-1142, fig. 1).—The authors here present data which supplement work previously noted (*E. S. R.*, 69, p. 240). The steps in the improved technic are described and illustrated.

Nicotine vapor in codling moth control, R. H. SMITH, H. U. MEYER, and C. O. PERSING (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1192-1195, figs. 2).—In work at the California Citrus Experiment Station during the summer of 1934 it was found that 1 cc of Black Leaf 50 when vaporized was more effective in killing codling moths than was 30 cc of liquid HCN. When nicotine vapor was applied by a Nicofumer, a portable machine devised for utilizing nicotine in the form of vapor or finely atomized mist, the results obtained in orchard tests were sufficiently encouraging to warrant the conclusion that the method may possess considerable merit. The results of treatments made with this portable fumatorium, by use of which trees may be enclosed and treated at the rate of one tree each half minute, indicate that all the moths in trees 24 ft. in height and 24 ft. in spread can be killed with a dosage of 10 cc of Black Leaf 50 per tree, where the rate of treatment is one tree per minute. It is thought possible that the moths can be killed by applying the vapor at night or whenever the atmosphere is calm, without using the fumatorium, using perhaps 30 cc of Black Leaf 50 per tree, at a cost of \$5.50 per acre for material and labor.

The work during the summer of 1934 has followed a series of orchard experiments carried on by the senior author during the summer of 1928 and designed to effect the control of the codling moth by killing the moths of the spring brood at intervals of 2 or 3 days throughout their period of emergence, or to supplement the control obtained with spraying by killing the moths at the peak of emergence of the different broods, using nicotine as the insecticidal agent.

Field experiments with *Beauveria bassiana* (Bals.) Vuill., a fungus attacking the European corn borer, K. A. BARTLETT and C. L. LEFEBVRE (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1147-1157).—The experiments thus far conducted have shown that European corn borer larvae in the field are readily susceptible to attack by *B. bassiana*, it being possible by dusting fields of infested corn and weeds with a mixture of spores and flour to infect larvae and obtain

a high reduction in the larval survival. "The results show that the fungus can successfully overwinter and reestablish itself on new larvae the following year, but as yet the recovery data are insufficient to indicate whether or not the fungus will prove to be of value as a natural enemy under field conditions. All recoveries thus far have been made in weed areas where natural disintegration of the plant affords exposure to dead larvae and a good opportunity for reinfection. The establishment of the fungus in corn-growing areas remains in doubt."

The Canadian species of the tortricid genus *Peronea*, J. McDUNNOUGH (*Canad. Jour. Res.*, 11 (1934), No. 3, pp. 290-332, figs. 81).—In this contribution 43 species of the tortricid genus *Peronea*, comprising all forms known to occur in Canada at the present time and including practically all the North American forms, are dealt with. Seven species are described as new to science.

The light brown apple moth, H. M. NICHOLLS (*Tasmanian Jour. Agr.*, 5 (1934), No. 2, pp. 68-72, figs. 2).—*Tortrix postvittana*, here considered, is a source of injury to fruit in Tasmania and all the Australian States except Western Australia. It has also gained entrance into the Hawaiian Islands, and specimens have occasionally been found in England. Its injury is caused by gnawing holes in the fruit and rolling up and eating the leaves.

A progress report on the control of the cherry case bearer (*Coleophora pruniella* Clem.) in Wisconsin, J. H. LILLY and C. L. FLUKE (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1142-1147).—In continuation of work at the Wisconsin Experiment Station (E. S. R., 69, p. 830) some dormant lime-sulfur plats gave satisfactory control of the cherry casebearer, particularly the fall applications. There was also some evidence that early spring dormant applications of this material were more effective than those applied later in the spring dormant stage. Dormant lime-sulfur should be used at a concentration of 1:8 for casebearer control. Neither arsenate of lead nor blood albumin appeared to increase materially the effectiveness of dormant lime-sulfur as a casebearer control.

"A 'cold-mix' petroleum oil of low viscosity (*Spuria*) appeared to be superior to a cold-mix oil of medium viscosity (*Tiara*) for casebearer control, and it is probably less dangerous to the host trees. Cold-mix oil emulsions need not be used in concentrations higher than 6 percent for casebearer control, and even this strength is highly detrimental to both fruit and leaf buds under some conditions. Miscible oils were not quite as toxic to the casebearer as the cold-mix preparations, although they are probably less apt to cause tree injuries. A tar-oil wash (*Barko*) gave effective casebearer control at 8 percent and 6 percent concentrations.

"Each of these three types of dormant spray materials has both advantages and disadvantages as a casebearer control under average orchard conditions. Dormant lime-sulfur seems to be entirely harmless to fruit trees, but it fails to check two other serious apple pests, [eyespotted] bud moth and fruit tree leaf roller. The petroleum oil emulsions result in more or less tree injury, but they usually give satisfactory control of the leaf roller. The tar-oil wash used (*Barko*) apparently does not seriously injure the host trees, and the higher concentrations of it seem to give partial control of both bud moth and fruit tree leaf roller.

"Thorough spraying from the ground is again emphasized as the keynote to successful casebearer control."

Experiments with dormant sprays for control of leaf and nut case-bearers, F. W. WALKER (*Ga.-Fla. Pecan Growers Assoc. Proc.*, 27 (1933), pp. 31-33, 35).—A brief practical account of work at Monticello contributed from the Florida Experiment Station.

The apple fruit miner (*Argyresthia conjugella* Zell.), J. H. STAPLEY (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 87-92, figs. 9*).—An illustrated summary of information on the apple fruit moth and preliminary attempts to control it.

Aquatic Diptera.—Part I, Nemocera, exclusive of Chironomidae and Ceratopogonidae, O. A. JOHANNSEN (*[New York] Cornell Sta. Mem. 164 (1934), pp. 71, pls. 24*).—Following an introductory account, keys for the larvae and pupae of North American aquatic Diptera are given, followed by descriptions of the superfamily Tipuloidea, with three families, and of nine families of aquatic Diptera. Tables for the separation of the larvae and pupae of the genera and larvae of the species are included. A six-page list of references to the literature and an index to the genera are included.

Biological notes on *Goniops chrysocoma* (O. S.) (Diptera: Tabanidae), H. H. SCHWARDT (*Jour. Kans. Ent. Soc., 7 (1934), No. 3, pp. 73-79*).—In continuation of studies of the Tabanidae in Arkansas (E. S. R., 70, p. 364), observations of all stages of *G. chrysocoma* in Washington County in 1931 and 1932 are reported. Four hundred larvae were collected, from which 52 adults were reared.

Catalog of the Tabanidae of South and Central America, including Mexico and the Antilles [trans. title], O. KRÖBER (*Rev. Ent., 4 (1934), Nos. 2, pp. 222-276; 3, pp. 291-333*).—The recognized forms of Tabanidae are listed in systematic order, the countries in which they are known to occur being indicated.

Observations on the flies responsible for striking sheep in Western Australia, M. E. FULLER (*Jour. Council Sci. and Indus. Res. [Aust.], 7 (1934), No. 3, pp. 150-152, fig. 1*).—Further information regarding the species of flies responsible for strike (E. S. R., 68, p. 646), obtained in work conducted from August to November 1933, is reported.

Sheep blowfly investigations: Some field tests of baits treated with sodium sulphide, M. E. FULLER (*Jour. Council Sci. and Indus. Res. [Aust.], 7 (1934), No. 3, pp. 147-149*).—The author has obtained sufficient evidence to make the addition of sodium sulfide to the baits in blowfly traps worth practical consideration. The treated traps not only catch a larger number of flies but remain attractive longer.

The discovery and introduction of the Amazon fly: A new parasite for cane-borers (*Diatraea* spp.), J. G. MYERS (*Trop. Agr. [Trinidad], 11 (1934), No. 8, pp. 191-195*).—This contribution relates to the tachinid parasite *Metagonistylum minense* Towns. and its introduction from Brazil into British Guiana.

The asparagus miner *Melanagromyza simplex* Loew (Diptera: Agromyzidae), H. F. BARNES and C. L. WALTON (*Ent. Mo. Mag., 3. ser., 20 (1934), No. 236, pp. 183-185*).—This contribution from the Rothamsted Experimental Station and the Long Ashton Research Station reports upon the appearance in England of the asparagus miner, an insect native to America.

A rat-flea survey of Ceylon, with a brief discussion of recent work on rat-flea species distribution in relation to the spread of bubonic plague in the East Indies, L. F. HIRST (*Ceylon Jour. Sci., Sect. D, Med. Sci., 3 (1933), No. 1, pp. 49-113, pls. 3, figs. 4*).—This is a report of rat flea surveys carried out at 32 stations in Ceylon, comprising every important center of population in every type of region, in the course of which 32,723 fleas were identified. The details are presented in large part in tabular form.

Distributional notes on Utah Coleoptera, G. F. KNOWLTON (*Jour. Kans. Ent. Soc., 7 (1934), No. 3, pp. 79-86*).—This contribution from the Utah Experiment Station adds to the known distribution of Coleoptera in Utah, the presentation being by families (E. S. R., 68, p. 224).

Immature stages of Indian Coleoptera (14, 15), J. C. M. GARDNER (*Indian Forest Rec.*, 20 (1934), Nos. 2, pp. 48, pls. 6; 8, pp. 17, pls. 2).—Part 14 of this continuation of the contributions previously noted (E. S. R., 70, p. 215) deals with the Curculionidae and part 15 with the Scolytidae.

Relation of air and bark temperatures of infested ponderosa pines during subzero weather, J. A. BEAL (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1132–1139, fig. 1).—It is pointed out that low winter temperatures are sometimes very important in the natural control of the western pine beetle. Since the cold must reach the insects through the protective covering of the outer bark, the thickness of this layer is of vital importance. "Hourly records of air and inner bark temperatures on infested standing ponderosa pine trees during a period of rapidly falling temperatures showed that when the air reached a temperature as low as -26° F. for a short time only, the subcortical temperature in trees ranged from 8° to 29° higher. These differences in subcortical temperatures are due largely to the thickness of the bark. Thin bark closely follows the trend of air temperatures, while thicker bark responds more slowly and requires either long duration or excessive cold to reach temperatures fatal to the brood. Temperature variations according to side of trees are not believed to be very important. For a brief period during the middle of sunny days the south side warms up more than the shaded portion, but bark temperatures rapidly fall again during the night so that all sides are about equal. The sunlight on the snow also shows a tendency to warm all sides of the trees above air temperature. . . .

"In general it can be said that subzero temperatures usually result in some brood mortality of the western pine beetle, and that air temperatures below -15° result in important reduction of the broods."

The pepper weevil, J. C. ELMORE, A. C. DAVIS, and R. E. CAMPBELL (*U. S. Dept. Agr., Tech. Bul.* 447 (1934), pp. 28, figs. 16).—A study made of the pepper weevil, which causes serious damage to peppers in the Southwest, particularly in California, Texas, and New Mexico, conducted by the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with the California Experiment Station, is here reported upon. This weevil, which was described from Mexico in 1894, made its first appearance in the United States in Texas in 1904, in California in 1923, and in Hawaii in 1933.

"The host plants are confined exclusively to varieties of pepper, nightshade, and eggplant. Damage from pepper weevil attack is from destruction of blossom buds and immature pods. Dissemination is accomplished by flight of the insect and transportation of infested material. Newly planted pepper fields become infested either from overwintering nightshade or from old pepper fields. The degree of infestation increases in proportion to the number of weevils entering the field. An infestation spreads gradually and may or may not be uniform over the field.

"The adult and immature stages of the pepper weevil are described. Adults feed on buds or tender pods of the pepper, but when these are not available they feed on tender foliage. They feed also on nightshade berries and foliage. Larvae feed on the contents of the bud or pod, or in the pod wall, of the pepper. Adult weevils spend the winter on nightshade or old pepper plants, being active on warm days. A true hibernation has not been observed in California, and in order for the weevils to survive the winter one of its host plants must be present. Migration to pepper fields begins in May or June at about the time the first buds form. Some weevils continue to breed on nightshade. The adult lives for 2 to 3 mo. in the summer, but overwintering individuals may live as long as 10 mo.

"Mating occurs soon after adult emergence, and oviposition begins from 2 to 8 days later. The eggs are laid singly in pepper buds or pods. In the laboratory the oviposition period ranged from 16 to 129 days, and during this time from 28 to 634 eggs were laid. Temperature directly affects ovulation and oviposition. Growth is rapid, the total time of development from egg to adult being 16 to 23 days in the summer and 22 to 46 days in the spring and fall. All stages except the adult stage are passed within the bud or pod. The adult emerges from the pod by cutting a clean round hole. The proportion of males ranged from 45 to 72 percent, usually with an excess of males.

"In different years maxima of 5 to 8 generations were found.

"Natural enemies are of little importance in checking a pepper weevil infestation. Calcium arsenate gave satisfactory control, but this material cannot be recommended because of the possibility of an arsenical residue. All fluorine dusts caused plant injury. Destruction of all pepper plants after harvest and cleaning up of nightshade plants in the vicinity proved to be the best method of keeping the pepper weevil in check."

A list is given of 13 references to the literature.

Ineffectiveness of surface cultivation to prevent the burrowing of pecan weevil larvae into the soil under pecan trees, T. L. BISSELL (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1128-1130).—It is concluded from the studies by the U. S. D. A. Bureau of Entomology and the Georgia Experiment Station, cooperating, here reported (*E. S. R.*, 66, p. 252) that cleaning and smoothing the surface of the soil under pecan trees cannot be depended upon to control the pecan weevil larvae in all years.

The clover root curculio, H. H. JEWETT (*Kentucky Sta. Circ.* 42 (1934), pp. 13-23, figs. 6).—It is pointed out that laboratory and field experiments have shown the clover root curculio to be capable of doing a great deal of damage to clover and alfalfa, young seedlings being especially susceptible to injury. The present account is based upon such a study, commenced in the spring of 1932 with a view to determining the extent of the injury and its effect on clover and alfalfa.

Yields of alfalfa from plants infested for two seasons were reduced as much as 18.6 percent. There was found to be little difference in reduction of yield of plants from spring-sown and fall-sown seed. During the seasons of 1932 and 1933 the beetles were not found in the field in large enough numbers to cause any serious damage to clover and alfalfa. The insect at present should be recognized as a potential pest with possibilities for doing a great deal of damage under conditions that permit any great increase in numbers.

A progress report on the behavior of the alfalfa weevil in middle California, 1935, A. E. MICHELbacher and E. O. ESSIG (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1119-1127).—It is pointed out that this contribution on the status of the alfalfa weevil in middle California, where it was first discovered by Blanchard in May 1932 (*E. S. R.*, 68, p. 215), should precede the report on investigations of it (*E. S. R.*, 72, p. 368).

It was found that the weevil behaves differently in the three areas considered in the present paper. Under natural conditions it has been found breeding on four different hosts, which, in order of their importance, are alfalfa, bur clover, yellow sweetclover, and white sweetclover. The authors conclude that bur clover and yellow sweetclover are important natural hosts in maintaining the weevil outside of alfalfa fields and may materially aid in its natural distribution. It is pointed out that both of these plants appear with the first fall and winter rains and afford ready food for the weevil until early summer.

Hymenopterous parasites of the western apple curculio in northeastern Kansas (*Tachypterellus quadrigibbus magnus* List (Coleoptera, Curcu-

lionidae)), R. L. PARKER and P. G. LAMERSON (*Jour. Kans. Ent. Soc.*, 7 (1934), No. 3, pp. 90-95).—This contribution from the Kansas Experiment Station records observations of the parasites of *T. quadrigibbus magnus* during the years 1932 and 1933. Three parasites, namely, *Eurytoma tylodermatis* Ashm., *Microbracon tachypteri* Mues., and *M. variabilis* (Prov.), were reared. It is concluded that the disparity in the degree of total parasitism for the 2 yr. would indicate that little reliance should be placed on these parasites for the control of this form.

A list is given of 10 references to the literature.

The vegetable weevil (*Listroderes costirostris* Gyll.), R. T. M. PESCOTT (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 8, pp. 410-413, figs. 6).—A brief summary of information on this pest in Victoria and the control measures employed.

Calcium carbonate as a weevil control, E. R. DE ONG (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1131, 1132).—In the course of the author's investigation it was found that calcium carbonate on calcium treated rice was not only of value in retaining the rice flavor but also protected the rice against rice weevil and confused flour beetle injury.

Variation in the number of egg tubules in the queen bee, E. OERTEL (*Jour. Econ. Ent.*, 27 (1934), No. 6, pp. 1111-1118).—In a study of the number of egg tubules in 73 laying queen bees procured from several queen breeders the author found a variation of from 75 to 175 tubules per ovary. Virgin queen bees having the same mother were found to vary in the number of egg tubules. The condition of the colony which reared them apparently had little or no effect upon the number of egg tubules. "The simple correlation between number of egg tubules and length of abdomen is 0.284; between number of egg tubules and depth of abdomen is 0.141; between number of egg tubules and width of abdomen is 0.209. The multiple correlation between number of egg tubules and length, depth, and width of abdomen is 0.341. These correlations are not statistically significant."

Saprophytic fungi associated with the honey bee, C. E. BURNSIDE (*Mich. Acad. Sci., Arts, and Letters, Papers*, 8 (1927), pp. 59-86, pl. 1, figs. 13).—The author considers the penicillia, aspergilli, mucors, and miscellaneous fungi found during the course of an extensive survey to occur on and inside honeybees and on the comb. One of the most common pollen fungi that occurs on stored pollen in the spring in hives in which colonies have died during the winter and in hives occupied by weak colonies is described as new under the name *Ovularia farinaecola*. This fungus is limited in its development within the beehive to the pollen plugs.

Comparison of *Pericystis alvei* from Europe and the related species from America, C. E. BURNSIDE (*Bee World*, 15 (1934), No. 9, pp. 105, 106, fig. 1).—The author concludes that the saprophytic fungus which he described from America in 1927 (above noted) as *Ovularia farinaecola* was in reality either the sex strain of *P. alvei*, described by A. D. Betts in 1912⁴ (see also E. S. R., 28, p. 562) from Europe as representing a new genus and species, or was very closely related to that species.

Control of spider mites on ornamental plants, C. C. HAMILTON (*New Jersey Stas. Circ.* 334 (1934), pp. 4).—A brief practical account including the life history and habits of mites, the nature of their injury, the principal species of spider mites implicated, and their control.

⁴ A bee-hive fungus, *Pericystis alvei* gen. et sp. nov. *Ann. Bot.*, 26 (1912), No. 103, pp. 795-799, pls. 2.

Observation on a method of dissemination employed by mites, W. EBE-LING (*Pan-Pacific Ent.*, 10 (1934), No. 2, p. 89).—Contributing from the California Citrus Experiment Station the author notes having observed the citrus red spider (*Paratetranychus citri* McG.), as many as eight mites per leaf at one time, lowering itself from infested leaves by means of a single thread. It was observed that the mites left a leaf only when the infestation had become large and the chlorophyll nearly depleted.

Amblyomma dissimile does not reproduce parthenogenetically in Venezuela [trans. title], E. BRUMPT (*Ann. Parasitol. Humaine et Compar.*, 12 (1934), No. 2, pp. 116–120, figs. 3).—In his study of the iguana tick *A. dissimile* collected in Venezuela, the author failed to confirm the report of Bodkin that it may reproduce parthenogenetically (E. S. R., 40, p. 359), as has been reported by H. de Beaufort Aragão to be the case with *A. agamum (rotundatum)* in Brazil.

The parasites of British birds and mammals.—II, Records of Ixodoidea (ticks), G. B. THOMPSON (*Ent. Mo. Mag.*, 3. ser., 20 (1934), No. 237, pp. 204–207).—Notes are presented on the occurrence of tick parasites of birds and mammals in Great Britain, together with other ectoparasites found on the same hosts (E. S. R., 71, p. 808.)

ANIMAL PRODUCTION

[Animal husbandry investigations of the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1934, pp. 4, 5–10, 11–14).—Data are reported from studies of the vitamin, protein, and fat content of meat meal, goats' milk, and other feeds and their effects upon animals; the effects of grass on meat quality; the effect of degree of finish on the quality and palatability of meat; a comparison of types of pigs on carcass desirability; the aging of cured hams; the importance of feeding meat animals as well as circumstances permit; the keeping qualities and uses of lards and their fats; feeding, breeding, management, and record-of-performance studies with beef and dual-purpose cattle, sheep and goats, swine, and horses; the breeding and feeding of poultry, and physiological and hatchability studies with eggs.

[Livestock investigations at the Missouri Station] (*Missouri Sta. Bul.* 340 (1934), pp. 5–10, 14, 26, 27, 35, 36, 37, 67–70, figs. 2).—Studies with cattle furnished information on protein supplements for yearling steers full-fed on bluegrass pasture, and processing roughages for wintering stock calves, by E. A. Trowbridge and H. C. Moffett; feeding native beef calves, by Trowbridge, Moffett, and M. Hazen; and systems of grazing bluegrass pastures, by J. E. Comfort and E. M. Brown.

Swine tests produced results on rations for brood sows, by A. G. Hogan and S. R. Johnson; and rations for weanling pigs and pregnant sows, and feeding swine on concrete floors, by L. A. Weaver.

With poultry data were reported on soluble vitamin supplements for the chick, by Hogan and R. V. Boucher; influence of cod-liver oil, alfalfa leaf meal, and yellow corn upon production, hatchability, and quality of eggs, the use of artificial lights to stimulate winter egg production, the rate of growth of Rhode Island Red, White Rock, and White Leghorn pullets, and proportions in which meat scrap and dried skim milk may be used in chick rations, all by H. L. Kempster and E. M. Funk; the relation of the date of sexual maturity to egg production, the feed purchasing power of eggs laid by a hen, and the value of sour milk and beef scrap in rations for egg production, all by Kempster; and the relation of shell texture and the effect of crossbreeding, freezing

temperature, age, and hour of laying upon the hatchability of hens' eggs, by Funk.

Other studies upon which experimental results are reported are growth in draft colts, by Trowbridge, D. W. Chittenden, and S. Brody; nutritional properties of deaminized casein, nutritional requirements of rabbits, and nutritional properties of meat, by Hogan and W. S. Ritchie; basal metabolism and age, by Brody, Hogan, Kempster, A. C. Ragsdale, Trowbridge, W. C. Hall, U. S. Ashworth, and Funk; the influence of fasting on body weight and on energy and nitrogen metabolism in chickens and pigs, by Brody, V. W. Phillips, and Ashworth; the energy difference between standing and lying, by Brody and Hall; endogenous nitrogen metabolism in rats, by Brody and Ashworth; the influence of the plane of nutrition on the usefulness of feeding stuffs in cattle and rabbits, by Brody and R. C. Proctor; and the energy cost of walking, by Brody and Hall.

[Experiments with livestock at the Wisconsin Station] (*Wisconsin Sta. Bul.* 428 (1934), pp. 9-16, 17, 18, 46-53, fig. 1).—Results obtained in studies with swine are reported on the limitations of rock phosphate as a mineral feed, by P. H. Phillips, G. Bohstedt, J. M. Fargo, and E. B. Hart; dried skim milk vs. dried buttermilk as a protein feed for pigs, by Bohstedt, Fargo, and R. W. Ries; a comparison of skim milk and whey for pigs on rape pasture, by Bohstedt and Fargo; and molasses for pigs, by Bohstedt, B. H. Roche, Fargo, I. W. Rupel, J. G. Fuller, and P. E. Newman.

Information was obtained on the value of molasses for fattening steers and lambs, by Bohstedt, Roche, Fargo, Rupel, Fuller, and Newman.

With poultry data were obtained on rock phosphate for chickens, by Phillips, Hart, and J. G. Halpin; increasing the vitamin B and G of eggs with special rations, by Halpin, H. R. Bird, O. L. Kline, and C. A. Elvehjem; soybean oil meal as a partial source of protein in laying rations, and vitamin G supplements for increasing egg hatchability, both by Halpin, C. E. Holmes, and Hart; favorable salt levels for poultry rations, tankage compared with meat scrap in chick rations, effect of rye on egg production of pullets, and effect of unbalanced mineral ratio in feed on slipped tendons in chicks, all by Halpin and Holmes; crooked breast bones in flocks deprived of vitamin D, by Halpin, Holmes, Hart, J. A. Keenan, and Kline; and relation of preen gland to rickets in chicks, by H. R. Knowles, Hart, Halpin, and Holmes.

Problems of animal nutrition and animal husbandry in Northern Nigeria, A. W. ANDERSON (*Imp. Bur. Anim. Nutrition [Aberdeen], Tech. Commun.* 4 (1933), pp. 52).—The results of four studies are noted in this contribution from the Agricultural Department of Nigeria.

The composition of the pastures of Northern Nigeria.—When compared on a dry-matter basis with good European standards, Nigerian pastures were low in nitrogen, calcium, phosphorus, and potassium. A normal seasonal variation in quality was observed that corresponded to the rainfall curve. However, a valuable regrowth of young grass occurred in January that was independent of rainfall. The quality of these pastures compared favorably with that of pastures in other parts of Africa.

Feeding experiments on native cattle of Northern Nigeria.—Feeding trials with native 2-year-old heifers on pasture showed that supplements which supplied approximately 2 lb. of starch equivalent caused a 100 percent increase in weight and hastened the age of sexual maturity. The use of protein supplements was effective only during the season when the nitrogen content of the pastures was lowest. Feeding steamed bone flour and sodium chloride did not influence the rate of gain, age of sexual maturity, or general

condition. The inorganic phosphorus and calcium level of the blood of these cattle fell within normal limits, but the phosphorus level could be raised by feeding bone flour.

An investigation into the cause of pica in Nigerian cattle.—In tests with a mixed herd of cows and heifers it was found that pica could be controlled by supplying sodium in the form of salt. Pica was not associated with a calcium or phosphorus deficiency, and the metabolism of calcium, phosphorus, and chlorine appeared to be normal whether sodium was present or absent.

Some problems of animal husbandry in Northern Nigeria.—A general survey of conditions showed that pastures of this area were of low feeding value, especially during the dry season, and while mineral balances did not appear to be abnormal pica was prevalent. The standard of the cattle was low, and environmental conditions were such that improvement by importation was impossible. It is recommended that nutritional conditions be improved, and that selective breeding for high milk yield and high reproductive rate be practiced in the existing herds.

Recent research on forage crop cultivation, fodder conservation and utilisation, at the Animal Breeding Institute of the University, Königsberg. W. KIRSCH (*Imp. Bur. Anim. Nutrition [Aberdeen], Tech. Commun. 3 (1933), pp. 14; also Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 8 (1933), pp. 14*).—This paper gives a brief review of recent results of experiments on the feeding value of hay from pure grasses and mixtures of clover and grass, on the loss of nutrients in the conservation of green fodder by different methods, and on the ensilage of green crops.

On the yields and composition of meadow hay from certain of the Palace Leas plots at Cockle Park. F. J. ELLIOTT and B. THOMAS (*Jour. Agr. Sci. [England], 24 (1934), No. 3, pp. 379-389*).—This paper from Armstrong College, England, summarizes the available information as to the effects on yield and quality induced by different fertilizer treatments on pasture plots which had received the same treatment since 1897.

Basic slag, alone or in conjunction with other artificial fertilizers, was the most effective treatment for the production of high quality as measured by analysis. Omitting the phosphate component had a depressing effect. Feeding trials did not wholly confirm the results of the analysis, but did confirm the effectiveness of phosphate fertilizers.

The annual application of eight tons of manure per acre produced the heaviest yields in this study, followed by fertilizer treatments that included basic slag. Muriate of potash when used alone was the only treatment that depressed yield below that of the control plot. On the basis of total yields of digestible protein, lime, and phosphoric acid produced per acre, the use of basic slag combined with either sulfate of ammonia or muriate of potash, or both, gave the best results.

[Digestibility of the proteins of hay] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1934, p. 24*).—Data as to the place in the digestive tract of cattle where the liberation of protein from hay occurs are briefly noted.

A. I. V. silage (*Imp. Bur. Anim. Nutrition [Aberdeen], Tech. Commun. 1 (1932), pp. 14; also in Scot. Jour. Agr., 15 (1932), No. 3, pp. 252-261*).—In this paper the history, theoretical basis, application of method in practice, the characteristics, composition, feeding value, and the extent to which the practice of making A. I. V. silage is carried on are discussed.

The synthesis of aromatic amino acids from inorganic nitrogen by molds and the value of mold proteins in diets. C. E. SKINNER (*Jour. Bact., 28 (1934), No. 1, pp. 95-106, fig. 1*).—In this test it was found that, when grown in a synthetic medium whose only nitrogen source was $\text{Ca}(\text{NO}_3)_2$ and $(\text{NH}_4)_2\text{SO}_4$,

Aspergillus niger, *A. oryzae*, *A. terreus*, *Trichoderma köningii*, *Zygorhynchus moelleri*, *Penicillium flavo-glaucum* and an unidentified species of *Penicillium* gave strong tests for tyrosine, and all but one gave positive tests for tryptophane.

When used as a source of protein in an otherwise complete diet, 9 percent of the dried mycelium of *P. flavo-glaucum* allowed only slight growth of young rats, but at an 18 percent level the growth was much better. Adding 9 percent of gelatin to the dried mycelium ration did not increase the rate of growth, but when 9 percent of protein as casein or corn gluten was added normal rapid growth resulted. Paired-feeding tests showed that cystine, rather than the aromatic amino acids in the mycelium, was the limiting growth factor. It is concluded that all the essential amino acids were synthesized by *P. flavo-glaucum* from inorganic nitrogen, but that cystine was present in only small amounts. Both chemical and feeding tests showed that tyrosine and tryptophane were synthesized from inorganic nitrogen.

Microorganisms and vitamin production in green plants, N. A. CLARK and B. H. THOMAS (*Science*, 79 (1934), No. 2060, pp. 571, 572).—The results of studies at the Iowa Experiment Station indicated that when conditions were favorable for the growth of green plants the absence of micro-organisms did not affect the formation of vitamin A. There were also indications that within limits variations in light had little effect.

Studies on Vim Oat Feed.—2, **The digestibility of oat hulls**, C. J. WATSON, G. W. MUIR, and W. M. DAVIDSON (*Sci. Agr.*, 14 (1934), No. 12, pp. 633-644; *Fr. abs.*, p. 644).—Continuing this study (E. S. R., 70, p. 370) at the Central Experimental Farm, Canada, digestion trials were undertaken with steers fed oat hulls, coarsely ground, with and without a basal ration of hay or Vim Oat Feed, finely ground, when fed alone.

The coefficients of digestibility of each feed were lower when hay was fed than when the feeding stuff was given as the sole ration. The digestibility of the crude fiber of oat hulls was markedly higher, while the digestibility of the nitrogen-free extract was slightly lower than that of the Vim Oat Feed. It was not possible to determine a coefficient of digestion for the nitrogen of oat hulls, while the coefficient for nitrogen in Vim Oat Feed was about 50. There was no significant difference in the total digestible nutrients per 100 lb. of the two feeds. On the basis of these trials it was concluded that the feeding value of oat hulls was similar to that of Vim Oat Feed, but the latter feed may be given a slightly higher rating because it contains about 2 lb. of digestible protein per 100 lb., as compared with an undetermined smaller value for oat hulls.

Commercial feeds and their use in Kentucky in 1933, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and L. V. AMBURGEY (*Kentucky Sta. Regulat. Ser.* No. 5 (1934), pp. 84).—The results of the inspection and analyses of commercial feeding stuffs offered for sale in the State during 1933, together with information on and definitions of feeds and their components, are given (E. S. R., 70, p. 221).

Inspection of commercial feeding stuffs, 1934, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 281 (1934), pp. 57).—This is the usual report of the guaranteed and found analyses of 408 brands of feeding stuffs collected for official inspection during the year ended June 1934 (E. S. R., 70, p. 514).

The effect of the ration on wool growth and on certain wool characteristics, A. E. DARLOW, V. G. HELLER, and W. R. FELTON (*Oklahoma Sta. Bul.* 220 (1934), pp. 24).—For this study seven lots of four western wethers each were fed rations containing different amounts of protein and cystine. They were sheared before being placed on experiment, and this clip was used as a measure of their wool-producing capacity. The experiment was divided into three

phases of approximately 6 mo. each, and during one phase the animals were on the range. At the end of the first experiment four lots of four wethers each from the original groups were placed on experimental rations, including one lot which received a diet low in cystine.

While the information obtained in the two experiments was not in exact agreement, the combined data indicated that any ordinary balanced ration will permit sheep to produce wool that is normal in both quantity and quality. The amount and character of wool produced may be affected by drastic changes in the kind or amount of the ration, but rations usually considered quite unsatisfactory did not markedly influence the amount or quality of wool unless fed for long periods of time. As long as fine wool wethers remained in normal health, there was a tendency for wool production to remain normal. Wethers receiving an adequate amount of any ration produced more scoured wool than they did while on the range, and wethers on a submaintenance ration produced less scoured wool than they did while on more liberal feed. The diameter of fibers produced during a period when most lots were receiving an adequate ration showed a decrease as compared with fibers produced when the animals were on the range.

Pulling out wool fibres and its effect on hairiness, K. M. RUDALL (*New Zeal. Jour. Agr.*, 48 (1934), No. 3, pp. 162-170, figs. 6).—Preliminary experiments on pulling out wool fibers at the Massey Agricultural College showed that regeneration of new fibers from the old papillae began almost at once, the fibers beginning to penetrate through the skin at 2 weeks. Several cases were found where the medulla was noticeably reduced following pulling. Freedom from hairiness after epilation was considered a good indication of vigorous keratinizing power. The value of these findings for the examination of the fleece of lambs of unknown history is discussed.

It was also found that wool that had been mishandled by tugging became "smoky", that is, showed air spaces in the cortex. In extreme cases such fibers were decidedly weakened.

Statistical methods of analysis applied to the feedlot gains of lambs, J. C. FOSTER (*Colorado Sta. Tech. Bul.* 10 (1934), pp. 27, figs. 4).—The records of lamb-feeding tests covering a period of 6 yr. were analyzed, in which rations of corn and alfalfa hay were compared with corn, alfalfa hay, and wet beet pulp. A total of 146 lambs was fed each of the above rations.

The correlation of variation in the ability of individual lambs to gain in the feed lot was 21 percent of the average gains of the lambs. Sex caused most of the variation in individual gains. Variations in length of feeding period and in initial weights of lambs did not materially influence the gains for feeding periods of 75 to 120 days in length.

Student's method of paired comparison demonstrated as significant smaller mean differences than did the deviation of the mean method or the standard for determining standard deviation. When the numbers of lambs per lot were less than 30 the element of chance materially affected the results, and at least 40 lambs should be used before too much reliability can be placed in results. Because of variations due to season, it was found that 10 pairs of lambs fed in 4 seasons would give more reliable results than 40 lambs fed in 1 season. It was apparent that reliable significance could be determined for the data of a comparison that gave a mean difference equal to and a standard deviation no larger than that of the rations compared with 4 trials of 10 pairs of lambs. In setting up pairs for analysis by paired comparisons, sex was a more important factor than initial weight. Weight data from lambs paired when allotted, but group-fed, could be satisfactorily analyzed, but this method of feeding did not permit recognition of the variability in individual feed con-

sumption. By using paired lambs fed individually, it was possible to weigh variations in gains and to study the correlation between gains and amounts of feed consumed.

The relation between faulty winter feeding of ewes and the susceptibility of their lambs to pulpy kidney, A. LESLIE (*New Zeal. Jour. Agr.*, 48 (1934), No. 4, pp. 197-204).—The Canterbury Agricultural College presents evidence to show that one factor in predisposing young lambs to pulpy kidney was faulty feeding of the dam. This maternal malnutrition was believed to act in two ways (1) by causing impoverishment in the nutrition of the newborn and (2) by lowering the milk yield. Etiological significance was attached to the higher susceptibility of twins. There was also a close association between susceptibility and slow growth.

Lambs born to ewes that had had access to fresh green pasture for some time before lambing were less susceptible to this condition than lambs born to similar ewes that had reached a low plane of nutrition previous to lambing. Improved feeding of pregnant ewes is suggested as one preventive for pulpy kidney disease.

Paralysis and avitaminosis A in swine, G. DUNLOP (*Jour. Agr. Sci. [England]*, 24 (1934), No. 3, pp. 435-456, figs. 2).—The Animal Nutrition Research Institute, Cambridge, undertook a study of swine paralysis which developed in experimental animals fed rations recommended for general use.

The results showed that rations made up of either barley meal, middlings, and fish meal, or cereals, soybean meal, and minerals were deficient in vitamin A and had a depressing effect on rate of growth and efficiency of gains. On these rations swine developed the paralysis characteristic of vitamin A deficiency at about 150 lb. live weight, or about 14 weeks after weaning. When a vitamin A supplement was fed in adequate amounts during suckling and for a month after weaning these rations were suitable for normal growth to bacon weight. However, this procedure allowed only a small margin of safety, and the vitamin A reserves were practically exhausted after the animals had received these rations alone for 18 weeks. Prolonging the feeding of the vitamin supplement produced normal growth and provided a greater margin of safety.

Effects of inbreeding on fecundity in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul.* 312 (1934), pp. 8).—For this study three inbred lines were established, using the following standards in the selection of female breeders: Sexual maturity, weight at first egg, winter pause, winter clutch size, broodiness, persistency, hatchability, egg weight, and range mortality. One inbred line failed to give any satisfactory breeding females in the third generation and was discontinued, while the other two lines were crossed after this generation and bred as such.

The results showed that inbreeding increased range mortality, the percentage of birds with winter pause, winter egg weight, and laying house mortality, retarded sexual maturity, and reduced intensity, persistency, hatchability, and annual egg production without reducing its variability. Crossbreeding inbred lines decreased range mortality in the first cross only, hastened sexual maturity, reduced the proportion of birds with pause, increased intensity, persistency, hatchability, egg size, and annual production but did not affect variability in this factor, and reduced laying-house mortality over that of inbreds. Neither the inbreds nor inbreds crossed were superior in any respect to the general flock. Inbreeding apparently failed to increase fecundity.

Factors influencing hatchability in the domestic fowl, E. M. FUNK (*Missouri Sta. Bul.* 341 (1934), pp. 22, figs. 5).—The reported data were based on the records of hatching eggs produced by White and Barred Plymouth Rocks, Rhode Island Reds, and White Leghorns for the years 1931 to 1934, inclusive.

The results showed that high summer temperatures were detrimental to hatching and may increase the egg cost per chick as much as 50 percent. Low temperatures resulting from sudden changes in the weather resulted in poor hatches for 4 and 5 weeks following the change. High production during the winter and spring months and during the entire year had no detrimental effect on hatchability. Eggs laid by pullets hatched better than those laid by hens. With the strains of birds used, large egg size and low hatchability were associated. Crossbreeding was found to improve hatchability, and eggs laid in the afternoon hatched better than those laid in the morning. Shell texture was not found to be related to hatchability.

Turning eggs held from 1 to 7 days before setting did not significantly influence hatching results, but holding eggs longer than 14 days decreased hatchability and those held more than 28 days failed to hatch. Eggs held from 14 to 21 days required from 14 to 18 hr. longer for incubation than those held less than 8 days. Holding eggs for 48 hr. or less at temperatures varying from 32° to 38° F. had no harmful effect on hatchability, while a period of 96 hr. or more under similar conditions decreased hatchability and after 196 hr. all eggs failed to hatch. Temperature had a cumulative effect on the development of the chick embryo, even though the process was arrested in the early stages. Preincubating eggs at 101° for 18 to 26 hr. reduced hatchability as compared with eggs cooled immediately after laying, but preincubating for 6 and 12 hr. had no apparent effect on hatchability. The slow-hatching chicks were apparently low in vitality, since the first 90 percent hatched had a mortality of 8.7 percent during the first 8 weeks, while the last 10 percent had a mortality of 24 percent during the same time.

Variation of sex difference in chick growth, S. BIRD and H. S. GUTTERIDGE (*Sci. Agr.*, 14 (1934), No. 8, pp. 433-437; *Fr. abs.*, p. 441).—Data obtained at the Central Experimental Farm, Canada, indicated that the normal sex difference in growth rate and absolute growth of chicks may be markedly influenced by environmental conditions. In the control lot one sex was quite severely affected by these conditions, while the opposite sex, subjected to identical treatment, was only slightly if at all affected. This sex difference response would not have been apparent if the data had been treated as being from a mixed population and completely obscured if conversion factors had been used. Since similar or reversed conditions have been found in the data of other workers, it is concluded that mixed or converted growth data in fowls may be misleading and should not be used.

Growth of chickens as a function of feed consumption, H. W. TITUS, M. A. JULL, and W. A. HENDRICKS (*Jour. Agr. Res. [U. S.]*, 48 (1934), No. 9, pp. 817-835, figs. 10).—The formula given in the second paragraph of this article (*E. S. R.*, 71, p. 825) should read as follows: $W=A-BR^P$.

Haemorrhages in chicks reared on artificial diets: A new deficiency disease, H. DAM (*Nature [London]*, 133 (1934), No. 3372, pp. 909, 910).—In this paper from the Biochemical Institute, København (Copenhagen), the author describes extensive internal hemorrhages of chicks that occurred when fed a ration consisting of vitamin A-free casein, Marmite, salt mixture, and starch, 20:10:4.5:65.5, and varying amounts of cod-liver oil concentrates. The disease closely resembled scurvy, but administration of vitamin C in the form of lemon juice had no effect on the occurrence of the symptoms. It is concluded that the disease must be due to a deficiency in an antihemorrhagic factor different from vitamin C which is found in cereals and seeds.

On a scurvy-like disease in chicks, R. CRIBBETT and J. T. CORRELL (*Science*, 79 (1934), No. 2037, p. 40).—Attempts at the Kansas Experiment Station to reproduce the scurvylike disease described by Holst and Halbrook (*E. S. R.*, 71,

p. 370) failed. However, it was found that better growth was obtained when autoclaved yeast was substituted for part of the yellow corn and all of the air-dried yeast fed in the basal diet.

"Pick-out" shields control cannibalism in laying pullets, J. M. MOORE (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 2, pp. 78-81, figs. 5).—In this article the author describes two types of shields, one of rubber and the other of metal, that have proved satisfactory for preventing cannibalism in chickens.

Shall the layers be ranged or confined? D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.* 171 (1934), pp. 192-198, figs. 2).—Continuing these investigations (E. S. R., 71, p. 685), a series of nine tests was conducted.

Egg production was in favor of the layers on range. There was no significant difference in the rate of mortality between the confined layers which received a complete ration and those on a good range. On bare contaminated yards the egg production was lower and the mortality higher than with either of the above lots. Free range on good ground was not practical for commercial poultry keeping on a large scale, and in such cases the use of cinder sun yards or wire sun porches offered many of the advantages of range with little danger from contamination.

Time interval from first egg to standard egg weight in Rhode Island Red pullets, F. A. HAYS (*Massachusetts Sta. Bul.* 313 (1934), pp. 11).—Records for this study were obtained from Rhode Island Red birds hatched from 1928 to 1932, 409 of which attained standard egg weight during the pullet laying year and 140 of which failed to attain this weight.

Early hatching and extreme early maturity within a genetically early-maturing population were found to increase greatly the time to standard egg weight. Factors that increased to some extent the period to standard egg weight were small body weight at first egg, very high winter intensity, intense broodiness, and high winter egg production. Pause duration, annual egg weight, and annual egg production had no effect, while high persistency greatly reduced the time to standard egg weight.

Multiple correlations showed that about 58 percent of the variation in time to standard egg weight was due to variation in hatching age, age at first egg, weight at first egg, winter clutch size, winter pause, broodiness, and persistency. Unknown hereditary factors were probably the cause of 42 percent of the variation in this time interval. The birds that failed to reach the standard weight were handicapped by lack of body weight, extremely high intensity, intense broodiness, and lack of persistency. It is suggested that in breeding to increase egg size the breeding females be selected from those that attain standard egg weight in less than 75 days after the first pullet year.

The policy of the New Jersey egg laying contests, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen*, 21 (1934), No. 6, pp. 4).—The purposes and benefits of the New Jersey egg-laying contests are described in this publication.

Transmission of light by egg albumen, H. J. ALMQUIST, J. W. GIVENS, and A. KLOSE (*U. S. Egg and Poultry Mag.*, 40 (1934), No. 10, pp. 38, 40, 63; also in *Indus. and Engin. Chem.*, 26 (1934), No. 8, pp. 847, 848).—Studies of factors influencing the candling appearance of eggs at the California Experiment Station showed that the transmission of light varies in different layers of egg albumin, being lowest for the firm or gelatinous layer. Light transmission was correlated with the percentage of mucin in the albumin and varied with the temperature and pH, which affected the physical condition of the mucin. The differences in the candling appearance of eggs due to these factors were not necessarily correlated with changes in interior quality.

Formation of thin white, A. K. BALLS and T. L. SWENSON (*U. S. Egg and Poultry Mag.*, 40 (1934), No. 8, pp. 20, 21, 57, 58).—In this article from the

U. S. D. A. Bureau of Chemistry and Soils the authors present experimental results indicating that the change of thick to thin egg white and the weakening of the yolk membrane were due to the action of the proteolytic enzyme, trypsin, which is found in the thick white. The formation of thin white was a slow process due to the presence of an inhibitor and was more rapid at warm temperatures than in cold storage.

Vitamin D content of egg yolk.—II, The influence of various sources of vitamin D on the antirachitic value of egg yolk. III, The antirachitic value of market eggs, H. D. BRANION, T. G. H. DRAKE, and F. F. TISDALL (*U. S. Egg and Poultry Mag.*, 40 (1934), Nos. 8, pp. 22, 23, 58, fig. 1; 9, pp. 22, 23, 52, 54, fig. 1).—In continuing these cooperative studies (E. S. R., 71, p. 686), the results showed that egg yolks were a good source of the antirachitic vitamin. The addition of 1 percent of cod-liver oil to the ration of hens increased the antirachitic potency of yolks 6 to 8 times. Large quantities of irradiated ergosterol were relatively inefficiently transferred to the yolk, although massive doses increased the antirachitic potency some 600 times and medium doses about 35 times. Small doses of ergosterol were transferred to the yolk as efficiently as cod-liver oil. Irradiating birds with ultraviolet light for 20 min. daily or exposing them to sunshine during the summer months caused only a slight increase in the antirachitic value of the eggs. Holding eggs for 8 to 11 mo. in cold storage had little or no effect on the vitamin D content. Irradiated ergosterol fed orally to laying hens was deposited as irradiated ergosterol in the yolks.

Nutritional requirements of rabbits and guinea pigs, A. G. HOGAN and W. S. RITCHIE (*Missouri Sta. Res. Bul.* 219 (1934), pp. 28, fig. 1).—This investigation showed that the nutritional requirements of the rabbit were distinctly different from those of the rat or chick. The difference was due in only a minor degree, if at all, to the need for bulk.

Simplified diets containing 15 percent of yeast were used with a considerable degree of success for raising rabbits, as were also diets that had proved successful with chicks, in which all of the vitamin carriers were in soluble form. The diet containing 15 percent of yeast was less suitable for guinea pigs, even when fortified with orange juice. Guinea pigs grew as well, if not better, than rabbits on diets that contained the vitamin carriers in soluble form, but appeared to require more bulk. Guinea pigs grew well on diets containing 15 percent of cellulose, but failed when the level of cellulose was reduced to 3 percent. The simplified diets were not successful for the reproductive cycle, only two litters of rabbits being weaned from such diets. Many of the young produced on these simplified diets were born dead, and the others survived only a few days.

The nutritional requirements of rabbits and guinea pigs did not differ in any essential respect when vitamin C was disregarded. However, when this vitamin was included the nutritional requirements of the rabbit, guinea pig, and chick differed from each other, and all differed from the requirements for the rat. It has not been established whether the differences are quantitative or qualitative.

[Experiments with rabbits at the U. S. Rabbit Experiment Station] (*U. S. Dept. Agr., Bur. Biol. Survey Rpt.*, 1934, pp. 13, 14).—The results of feeding and management tests with rabbits are briefly reported.

DAIRY FARMING—DAIRYING

[The American Dairy Science Association, twenty-ninth annual meeting] (*Amer. Dairy Sci. Assoc. Ann. Meeting, Ithaca and Geneva, N. Y.*, 29 (1934), *Abs. Papers*, p. 102).—Contributions presented at the annual meeting of the

association (E. S. R., 71, p. 371), held at Ithaca and Geneva, N. Y., June 1934, include the following in general, production, and manufacturing sections: Progress in the Study of Hormones Concerned with Milk Secretion, by C. W. Turner (p. 7); Sugars and Lactose Formation, by W. E. Petersen and W. R. Brown (p. 8); Removal of Salts from Whey Protein for Use in Infant Feeding, by P. D. Watson (p. 9); The Vitamin-A Content of Butterfat from Ayrshire, Guernsey, Holstein, and Jersey Cows: Part I, Biological Response, by T. S. Sutton and W. E. Krauss (p. 10), Part II, Relationships between Yellow Color, Carotene, and Vitamin A, by W. E. Krauss and T. S. Sutton (p. 10); Milk Marketing Agreements and Licenses, by J. B. Parker (p. 11); Michigan Plan of Dairy Products Utilization Campaigns, by A. C. Baltzer (p. 12); The Iodine Content of Milk as Affected by Feeding Iodized Dry Milk, by Z. M. Hanford, G. C. Supplee, and L. T. Wilson (p. 13); The Production of Vitamin D Evaporated Milk by Irradiation, by K. G. Weckel and H. C. Jackson (p. 14); The Commercial Production and Scientific Value of Soft Curd Milk Produced by Base Exchange Treatment, by H. E. Otting and J. J. Quilligan (p. 15); Mineral Nutrition, Illustrated, by R. B. Becker, W. M. Neal, and A. L. Shealy (p. 16); Can Nutrition and Feeding Experiments Be Improved? by F. B. Morrison (p. 17); Effect of Temperature of Artificial Drying on Digestibility and Availability of Nutrients in Pasture Herbage, by R. E. Hodgson, J. C. Knott, R. R. Graves, and H. K. Murer (p. 21); Increased Hay Feeding for Dairy Cows, by C. F. Monroe and H. Allen (p. 22); Feeding Dairy Cattle on Alfalfa Hay and Irrigated Pasture without Grain, by H. S. Willard (p. 23); A Comparison of Blue Grass Pasture with Pastures of Sweet Clover Seeded with Oats or Oats and Field Peas, by R. A. Ackerman and H. O. Henderson (p. 24); Pasture Fertilization Results, by R. H. Lush and J. L. Fletcher (p. 25); Early-Cut Nitrogen Fertilized Timothy Hay vs. Alfalfa Hay for Milk Production, by G. W. Salisbury and F. B. Morrison (p. 26); The Nutritive Value of the Proteins of Alfalfa Hay and Other Feeding Stuffs, by K. L. Turk and F. B. Morrison (p. 27); Pasture committee report, by R. H. Lush et al. (p. 28); The Development of Nutritional Anemia in Dairy Calves, by C. E. Knopp, W. E. Krauss, and R. G. Washburn (p. 29); The Iron and Copper Content of Milk throughout the Season as Related to Anemia Development in Rats, by W. E. Krauss and R. G. Washburn (p. 30); Carotene and Vitamin A in Dairy Feeds, by E. A. Kane (p. 31); Carotene and Vitamin A in the Nutrition of Dairy Calves, by H. T. Converse and E. B. Meigs (p. 32); The Value of Certain Home Grown Roughages and Concentrates in Maintaining a High Vitamin A Value of Butterfat, by J. H. Hilton, J. W. Wilbur, and S. M. Hauge (p. 33); The Effect of Age and Phosphorus Intake on Inorganic Phosphorus Content of Whole Blood of Dairy Heifers, by A. H. Van Landingham and H. O. Henderson (p. 34); Influence of Dry Period and of Mineral Supplement on Subsequent Lactation, by P. T. D. Arnold and R. B. Becker (pp. 35, 36); Fluorine Ingestion, Its Toxicity and Pathology in Dairy Cattle, by P. H. Phillips (p. 36); The Influence of Fat in the Milk on the Rate of Evacuation of the Calf's Stomach, by D. L. Espe and C. Y. Cannon (p. 37); Ovarian Development and Reaction to Experimental Administration of Gonadotrophic Hormones in the Calf, by L. E. Casida, I. W. Rupel, and A. B. Chapman (p. 38); The Theoretical Value of Grain in the Dairy Ration, by C. Y. Cannon and D. L. Espe (p. 39); The Feeding Value of Cane Molasses when Incorporated in Grain Mixtures for Dairy Cows, by G. Bohstedt, I. W. Rupel, B. H. Roche, and P. E. Newman (p. 40); Should Milk Yield Be Corrected for Age of Cow, or Size of Cow? by W. L. Gaines (p. 41); A Tentative Method for Correcting Milk Yield for Gains or Losses in Body Weight, by I. W. Rupel (p. 42); Significance of Body Weights in Feeding Experiments with Milk Cows, by A. H. Kuhlman

(p. 43); The Cow's Individuality and the Herd Management as Causes of Differences in Production, by M. Plum (p. 44); The Distribution of Nitrogen in Milk as Affected by the Level of Protein Feeding, by A. E. Perkins (p. 45); The Influence upon Milk Production of Three Different Planes of Protein Intake, by S. H. Work and E. S. Harrison (p. 46); Milk Production with Excessive Amounts of Cottonseed Meal, by A. H. Kuhlman and E. Weaver (p. 47); A Study of Bull Indexes, by E. S. Savage and M. Altman (p. 47); Production Factors, by J. P. La Master (p. 48); The Effect of Alfalfa Hay on Milk Flavor, by E. Weaver, E. L. Fouts, and A. H. Kuhlman (p. 48); The Effect of an Alfalfa Hay Ration on the Composition of the Milk Fat, by G. A. Richardson (p. 49); Influence of Environmental Temperature on the Energy Metabolism of Dairy Cows, by M. Kleiber, G. A. Richardson, and W. M. Regan (p. 49); Environmental Temperature and the Dairy Cow—The Effect of Green Pastures, by W. M. Regan and G. A. Richardson (p. 50); Effect of the Injection of Sterile Solutions, Milk and Oxygen into the Udder of the Dairy Cow on the Composition and Yield of Milk, by E. R. Garrison and C. W. Turner (p. 51); Proven Sires and Partially Proven Dams in the Experiment Station Herd, by A. C. Dahlberg (p. 52); The Apparent Digestibility and Feeding Value of Oat and Pea Stack Silage, by J. C. Knott, R. E. Hodgson, and H. K. Murer (p. 52); The Preparation and Nutritive Value of A. I. V. Alfalfa Silage for Dairy Cows (p. 53); Blood Leucocytes in Relation to Lactation, by H. A. Herman and C. W. Turner (p. 54); The Influence of Feed and the Individuality of Cows on the Susceptibility of Milk Fat to Oxidation, by J. L. Henderson and C. L. Roadhouse (p. 57); Studies of the Causes of Oxidized Flavors in Milk, by L. M. Thurston and W. C. Brown (p. 58); Another Source of "Oxidized" Flavors of Milk, by E. S. Guthrie and H. J. Brueckner (p. 59); Seasonal Variations in the Lipase Content of Milk, by J. L. Hileman and E. Courtney (p. 60); The Lecithin Content of Milk and Its Relation to Abnormal Milk, by B. E. Horrall (p. 60); Prevention of Cheesy Flavors in Unsalted Butter, by E. O. Herreid and H. Macy (p. 61); The Use of Dichlorofluorescein in the Determination of Chlorides in Milk and Dairy Products, by H. G. Lindquist (p. 62); Measuring Oxidation-Reduction Potentials, by R. J. Ramsey (p. 63); The Color Imparted to Coffee by Cream Treated in Various Ways, by R. Whitaker (p. 64); The Use of Citric Acid and Sodium Citrate in Buttermaking, by H. L. Templeton and H. H. Sommer (pp. 65, 66); Neutralizing High Acid Cream for Buttermaking, by E. L. Fouts and J. I. Keith (p. 67); The Application of the Microscope to the Biological Examination of Butter, by J. A. Nelson (p. 68); Bacteriological and Chemical Studies of Creamery Water Supplies, by H. Macy and F. E. Nelson (p. 68); Fat Test Variations in Weigh Tanks, by J. C. McCan (p. 69); Measurement of the Coefficient of Heat Transfer of Metals Used in Dairy Equipment, by L. C. Thomsen and T. Coker (p. 70); The Effect of Heat Transfer Rates upon Some Properties of Milk and Cream, by J. C. Marquardt and A. C. Dahlberg (p. 71); Change in pH of the Medium by the Growth of Yeasts (p. 72) and Influence of the Oxidation-Reduction Potential of the Medium upon the Growth of Yeasts and Molds (p. 73), both by E. H. Parfitt; Sedimentation in Homogenized Milk, by D. A. Charles and H. H. Sommer (p. 74); Some Considerations in the Homogenization of Milk, by C. J. Babcock (p. 74); The Optical Rotation of Casein, by D. C. Carpenter (p. 75); Studies in Rennin Coagulation—Factors Affecting the Nature of the Clot, by N. P. Tarassuk and G. A. Richardson (p. 75); The Physical Changes Involved in the Rennet Coagulation of Milk and the Subsequent Firming of the Curd, by H. A. Bendixen (p. 76); Studies in the Application of X-rays to Research in Dairy Technology: Structural Changes Occurring in Casein during Cheese Ripening, by S. L.

Tuckey (p. 77); Disturbance of the Natural Oxidation-Reduction Equilibrium of Milk, with Special Reference to the Use of Dehydrated Milk in the Manufacture of Cottage Cheese, by W. H. E. Reid and R. L. Brock (p. 78); Methods Used to Increase Blue Mold Growth in Cheese, by N. S. Golding (p. 79); Cream Cheese Spreads, by A. C. Dahlberg and J. C. Marquardt (p. 79); Color Development in Lactose Solutions during Heating with Special Reference to the Color of Evaporated Milk, by B. H. Webb (p. 80); The Fluorescence of Certain Milk Constituents in Filtered Ultra-violet Rays, by G. C. Supplee and Z. M. Hanford (p. 80); Certain Foam Producing Substances of Milk, by S. Ansbacher, G. E. Flanigan, and G. C. Supplee (p. 80); Influence of the Period of Lactation on Leucocyte Count of Milk, by E. O. Anderson (p. 81); Some Effects of Freezing upon Milk and Cream, by B. H. Webb and S. A. Hall (p. 81); Fat Distribution in Frozen Cream, by H. C. Trelogan and W. B. Combs (p. 82); A Note on Storage Temperatures of Frozen Fruits for Ice Cream, by J. C. Henning and A. C. Dahlberg (p. 82); Controlling Physical Properties of High Solids Mixes, by M. J. Mack (p. 83); The Effect of Aging Temperature on the Bacterial Count of the Ice Cream Mix, by W. S. Mueller and R. L. France (p. 83); Coli in Milk, by J. M. Brannon (p. 84); and Practical Limits for Bacterial Counts in Market Milk, by J. M. Brannon and M. J. Prucha (pp. 85, 86).

Report of the Chief of the Bureau of Dairy Industry, 1934, O. E. REED (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1934, pp. 1-11, 12-24*).—In addition to physiological research noted on page 463, investigations with dairy cattle resulted in data on the nutrition of dairy cows, chiefly as to vitamin A requirements; relation of the conformation and anatomy of the dairy cow to her milk- and butterfat-producing capacity; studies of grass silage, alfalfa hay, phosphorus requirements, incomplete milking, and artificial breeding at Beltsville and the field experiment stations; and herd improvement.

Results were obtained in studies with dairy products on the bacteriology and chemistry of milk, cheese, evaporated milk, and ice cream; cottonseed meal and udder troubles, including a test for the detection of mastitis; homogenized milk; effect of butterfat content and of standardization on the palatability of milk; effectiveness of the clarifier in removing leucocytes from milk; Devonshire clotted cream; methods of improving the quality of creamery butter; and improved methods for making Swiss cheese.

[Investigations with dairy cattle and dairy products at the Missouri Station] (*Missouri Sta. Bul. 340 (1934), pp. 35, 36, 37, 39-43*).—Tests with dairy cattle yielded results on growth efficiency of dairy cattle, by A. C. Ragsdale and S. Brody; growth and nitrogen metabolism in dairy cattle, by Ragsdale, Brody, and U. S. Ashworth; and an index to the quality of a dairy sire, by C. W. Turner.

With dairy products data were obtained on the sampling of milk for testing purposes where a combine milker is used, by H. A. Herman; the effect of heat on the colloidal, physical, and chemical changes occurring in milk, by E. R. Garrison and H. Jenny; serving temperature of ice cream, the crystalline structure of different ice creams, and the use of dried whole milk in the manufacture of cottage cheese, all by W. H. E. Reid; a microphotographic study of ice cream, by Reid and M. W. Hales; the effect of dried skim milk in the manufacture of cream cheese, by Reid and H. R. Alley; the effect of dried skim milk on whipped cream, by Reid and W. C. Eckles; the relation of chlorine to the keeping qualities of cottage cheese, by Reid and W. E. Painter; and the effect of light on cottage cheese, by Reid and R. L. Brock.

[Experiments with dairy cattle and dairy products at the Wisconsin Station] (*Wisconsin Sta. Bul. 428 (1934), pp. 17, 32-45, figs. 4*).—In tests with dairy cattle information was obtained on the value of molasses as a dairy feed,

by G. Bohstedt, B. H. Roche, J. M. Fargo, I. W. Rupel, J. G. Fuller, and P. E. Newman.

Data were obtained in investigations with dairy products on improving the keeping qualities of fresh whole milk by irradiation, and applying the irradiation process to evaporated milk, both by K. G. Weckel and H. C. Jackson; measuring the influence of metals on flavor of condensed milk products, by Z. D. Roundy and Jackson; factors responsible for efficiency in operation of cheese factories, by W. V. Price and H. H. Bakken; starter experiments for controlling flavor in brick cheese, by F. E. Hanson, Price, A. B. Ereksen, and E. G. Hastings; quick freezing of American cheese, by Price; sodium metaphosphate as an emulsifying agent of processed cheese, and the effect of acidity on whipping ability of cream, both by H. L. Templeton and H. H. Sommer; and effect of electric charge on fat globules on butter yield, by G. C. North and Sommer.

The nutritive value of proteins for milk production.—III, The determination of the amino acids of various feeds, S. MORRIS (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 108–112).—Continuing this study (E. S. R., 71, p. 88) at the Hannah Dairy Research Institute, Scotland, a modification of the method for estimating the amino acid content of feeding stuffs is described. A table is presented showing the distribution of nitrogen in the more important cattle feeds, expressed as percentage of total nitrogen.

Variations in the solids-not-fat content of milk.—I, The influence of the act of milking on the composition of milk. II, The lactation curve and the influence of various factors upon it, S. BARTLETT (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 113–123, figs. 4).—Studies were undertaken at the National Institute for Research in Dairying, England, to obtain information as to the normal variations in the solids-not-fat content of milk. Tests were made of this constituent of the milk of each cow one day each month. The total records covered about 300 complete lactation periods and involved solids-not-fat tests on approximately 10,000 milk samples.

The results showed that there was little variation in the solids-not-fat content of the first and last drawn milk during a single milking. Curves are presented to show the normal variation in this factor during a lactation period. These curves are influenced by the age of the cow and by pregnancy.

High-quality cream for butter making is easily produced by following 3 important steps (*U. S. Dept. Agr., Misc. Pub. 213* (1934), pp. 4, fig. 1).—The three important steps in the production of high quality cream are discussed, namely, producing clean cream, cooling cream and keeping it cold, and frequent delivery.

A study of factors influencing the keeping quality of some Victorian salted butters in cold storage, G. LOFTUS-HILLS, L. R. SCHARP, and T. S. BELLAIR (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 124–136, figs. 4).—In order to determine which of many factors control the keeping quality of butter under Victorian conditions of manufacture, the Victorian Department of Agriculture made bacteriological and chemical examinations of 70 boxes of salted butter before and after storing for 3 mo. at 12° F.

On the average only slight changes occurred in bacterial numbers during storage, and none of the bacterial, yeast, or mold counts showed any positive association with keeping quality. The catalase test also gave negative results. Chemical tests indicated that variations in curd or salt content did not affect keeping quality. Fat hydrolysis and fat oxidation did not appear to be important factors in deterioration. Butter acidity as measured by deterioration of water-soluble material and copper content appeared to be the most important

factors affecting keeping quality. The study did not show how acidity caused deterioration.

A study of the quantitative changes in the microbiological flora of sweet-cream salted butter of good keeping quality when held at 15° F. for a period of two to eight months, M. GRIMES and A. J. HENNERTY (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 137-143).—In order to study the changes in quality and texture of sweet cream salted butter held in cold storage for various periods, a series of churnings was made at the Dairy Science Institute, University College, Cork. A total of 49 churnings was subjected to microbiological examination at the time of making and during and after a storage period.

A slight increase in titratable acidity was observed following storage. There was a noticeable increase in yeast counts, in many cases without apparent injury to keeping qualities. The numbers of *Oidium lactis* present tended to decrease. The following types of bacteria persisted in decreasing numbers: (1) Various types of micrococci, (2) lactic acid bacteria of noncoagulating and acid-coagulating types, (3) acid coagulation and gas, (4) rennet digesting, (5) alkali forming, and (6) alkaline digesting.

Studies in Cheddar cheese.—II, The effect of controlled oxidation-reduction potential on ripening. III, The rôle of rennin, pepsin, and lactobacilli, W. L. DAVIES, J. G. DAVIS, D. V. DEARDEN, and A. T. R. MATTICK (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 144-152).—Continuing this study (E. S. R., 68, p. 242), experimental Cheddar cheese was made with the addition of certain substances likely to affect the oxidation-reduction potential. Other cheeses were made with various rennet preparations to determine the effect of the enzymes rennin and pepsin.

It was found that when copper was added as an oxidant to cheese to the extent of 36 p. p. m. it produced an abnormal flavor and markedly inhibited the ripening process. Other oxidants, such as potassium nitrate, chlorate, or perchlorate, held cheese at higher potentials and decreased the amount of proteolysis, especially after 5 mo. Potassium cyanide had no effect on the proteolysis or the oxidation-reduction potential. In this phase of the work it was concluded that normally the flora of cheese holds the oxidation-reduction potential at such a point that proteolysis is diminished if the potential is raised to the oxidative side.

Varying the amounts of rennin and pepsin appeared to have little effect on the flavor, texture, body, or ripening of cheese. There was no correlation between clotting time and extent of proteolysis. Adding lactobacilli with the starter appeared to accelerate the protein degradation in the early stages of ripening.

An investigation of Kuban fermented milk, V. M. BOGDANOFF (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 153-159).—In this study at the Dairy Products Research Institute, Moskva (Moscow), it was found that Kuban-fermented milk was characterized by lactic acid and alcoholic fermentation. The following microflora were always found in such milk: (1) A lactic acid producing a streptococcus resembling *Streptococcus hollandicus*, (2) a lactic acid-producing rod of the type of *Lactis bulgaricus*, and (3) three types of yeast. There was a close symbiosis between the component organisms. Inoculating the natural starter with *S. lactis* resulted in a rapid multiplication of this organism and an overproduction of acid, which imparted the taste of ordinary sour milk. A similar undesirable taste was produced if the product was prepared from raw instead of heated milk.

Effect of aging treatment on the bacterial count of ice cream mixes, W. S. MUELLER and R. L. FRANCE (*Massachusetts Sta. Bul. 314* (1934), pp. 8).—

This study (E. S. R., 70, p. 824) was planned to ascertain whether or not the aging temperature of 68° F., considered desirable when gelatin is used in the manufacture of ice cream, had an unfavorable effect on the bacterial count of the finished product.

It was found that aging a pasteurized mix for 6 hr. at 68°, whether followed by aging for 18 hr. at 38° or not, had no significant effect on the increase in the number of bacteria. On the other hand, aging an unpasteurized mix under similar conditions resulted in a material increase in the number of bacteria present. There was no definite increase in bacterial count until after the tenth hour in ice cream mixes aged for 24 hr. at 68°. Aging a mix for 24 hr. at 38° did not cause a material increase in the number of bacteria.

VETERINARY MEDICINE

Veterinary helminthology and entomology, H. O. MÖNNIG (*London: Bailière, Tindall & Cox, 1934, pp. XVI+402, figs. 264; rev. in Jour. Amer. Vet. Med. Assoc., 85 (1934), No. 4, pp. 546, 547; Vet. Rec., 14 (1934), No. 43, pp. 1296, 1297*).—Following a general discussion and a section on technic, the helminth parasites (pp. 23–257) and the arthropod parasites (pp. 259–381) are dealt with, the arrangement being in systematic order. A host-parasite list of those mentioned in the volume is included.

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1934, pp. 14–29, 35–52*).—The activities of the fiscal year ended June 30, 1934 (E. S. R., 70, p. 526), referred to include investigations of hog cholera as to the immunizing value of defibrinated blood virus and clear virus, serum-alone treatment followed by virus after an interval of nine days, preservatives for virus and serum, complement fixation and precipitation, vaccines, and control; of tuberculin and mallein; stained antigen for pullorum disease diagnosis; dips, disinfectants, and anthelmintics; infectious abortion; tuberculosis and its eradication; vesicular stomatitis; the eradication of scabies and of dourine; control of anthrax; inspection of meat and meat products; diagnosis and control of other diseases; testing biological products; bovine mastitis, swine erysipelas, ringworm in cats, infectious equine encephalomyelitis, and anaplasmosis; stock-poisoning plants; tick eradication; tuberculin testing of cattle; parasites of horses, ruminants, swine, poultry, and other animals; and treatment for internal and external parasites.

[Report of work in animal pathology at the Missouri Station] (*Missouri Sta. Bul. 340 (1934), pp. 77–80*).—The work of the year referred to (E. S. R., 70, p. 240) includes that with blackhead in turkeys, leucosis of fowls, pullorum disease in poultry, and vent gleet in fowls, all by A. J. Durant and H. C. McDougle; toxemia in sheep, by C. Elder and A. W. Uren; the transmission of the Bang abortion infection of swine to cattle, the significance of low agglutination reactions in unbred virgin gilts, and significance of low agglutination reactions in an unbred virgin heifer, all by Elder; the transmission of abortion infection in cattle from immune dams to progeny, by Elder, Uren, and A. M. McCapes; and poisonous effect of feeding Sudan and Johnson grasses, by Elder.

[Control work with livestock diseases in Nevada], W. B. EARL (*Nev. State Bd. Stock Commrs. Bien. Rpt., 1933–34, pp. 11–17*).—This report for the bien-nium ended June 30, 1934, deals with livestock disease conditions, bovine tuberculosis eradication, and Bang's disease in Nevada.

[Work in animal pathology and parasitology at the Wisconsin Station] (*Wisconsin Sta. Bul. 428 (1934), pp. 1–8*).—A brief statement of the work under

way at the station (E. S. R., 69, p. 865) includes data as to mastitis, accounts in which it is pointed out that cattle no longer reacting to the abortion test can safely mingle with susceptible animals and that C. A. Herrick, E. R. Carlson, G. E. Ott, J. G. Halpin, and C. E. Holmes have demonstrated that coccidia oocysts are not killed by incubation heat. The internal parasites found in an examination of the carcasses of 145 silver and cross foxes during a fur animal survey by F. B. Hadley and E. F. Graves are recorded, as are suggestions on feeding foxes.

Annual report of the veterinary service for the year 1933, R. J. ROE (*Cyprus Dept. Agr. Ann. Rpt., 1933, pp. 29-42*).—The occurrence of and control work with infectious diseases of livestock are reported.

[Contributions on diseases and parasites of animals and their control, and on poisoning, in the Union of South Africa] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 3 (1934), No. 1, pp. 5-130, figs. 19*).—The contributions here presented (E. S. R., 71, p. 837) include the following: Heartwater in Sheep—The Weil-Felix Reaction and an Investigation into the Bacterial Content of the Blood, with Particular Reference to the Use of "K" Medium, by J. H. Mason and R. A. Alexander (pp. 7-19); A Search for Tick Parasites in South Africa, by R. A. Cooley (pp. 23-42); Results of a Mosquito Survey at Onderstepoort during the Summer 1931-32 in Connection with the Transmission of Horsesickness, by O. Nieschulz, G. A. H. Bedford, and R. M. du Toit (pp. 43-77); Handling Mosquitoes for Experimental Purposes under South African Conditions, by O. Nieschulz and R. M. du Toit (pp. 79-95); *Echinococcus* in Dogs from Pretoria and Vicinity, by R. J. Ortlepp (pp. 97-108); Isolation of the Poisonous Principle of *Dimorphotheca cuneata* Less., by J. S. C. Marais and C. Rimington (pp. 111-117); and Plant Poisoning in Stock and the Development of Tolerance (pp. 119-123) (E. S. R., 70, p. 382) and Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa (pp. 125-130) (E. S. R., 70, p. 382), both by D. G. Steyn.

Annual report of the department of veterinary science and animal husbandry, 1933, H. E. HORNBY ET AL. (*Tanganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt., 1933, pp. [2]+111*).—In part 2 of this report (E. S. R., 70, p. 526) H. J. Lowe deals with the occurrence of and control work with infectious diseases and parasites of livestock (pp. 3-15). In part 3, S. A. Evans et al. deal with the routine and pathological work of the veterinary laboratory at Mpwapwa (pp. 16-48).

A manual of the tactics and strategy of warfare on parasites, M. C. HALL (*North Amer. Vet., 15 (1934), Nos. 1, pp. 40-48, 49, figs. 2; 2, pp. 24-33, 34; 3, pp. 24-33, fig. 1*).—In this contribution the nature of parasitic enemies of livestock and their combat are considered, the strategy of warfare against them being presented in detail and illustrated by charts.

Carbon tetrachloride: Its effect on the appetite of sheep, D. MURNANE (*Jour. Council Sci. and Indus. Res. [Aust.], 7 (1934), No. 3, pp. 145, 146*).—In the experiments reported there was no loss of appetite following the administration of therapeutic doses of carbon tetrachloride to sheep on green feed, the drenched sheep consuming slightly more than the controls. The author was unable to detect any dullness or drowsiness following the drenching. Animals on dry feed showed a definite drop in intake following the 24 hr. of starvation and drenching, but to no greater extent than the controls following 24 hr. of starvation alone. In neither case was there any evidence of a check in weights of treated sheep. Although the groups were small, it would appear that animals on hard feed are more liable to be upset by the administration of carbon tetrachloride than are those on green feed.

Arthropods and their relationship to diseases of domestic animals, G. W. RAWSON (*Sci. Mo.*, 39 (1934), No. 6, pp. 497-510).—A practical review of the subject.

Ticks, tick-borne diseases, and their eradication in South Africa, G. A. H. BEDFORD and H. GRAF (*Farming in So. Africa*, 9 (1934), No. 104, pp. 431-434, figs 6).—A practical summary of information.

Infection with a single coccidian oocyst and its significance, E. R. BECKER (*Amer. Nat.*, 68 (1934), No. 719, pp. 571-574).—The author describes the technic employed in a series of infections produced in laboratory rats with single sporulated oocysts of *Eimeria miyairii*. None of the 10 inoculated rats in the first series of experiments became infected.

Latent haemoprotozoal infections intercurrent and recidivous diseases: Observations and researches on the comparative pathology, M. CARPANO, trans. by E. TALAREWITCH (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 136 (1934), pp. 17, pls. 9).—The author reports (1) observations made in connection with the course taken by diseases determined by filtrable viruses, including bovine, equine, and avian plague and epizootic aphtha; (2) observations on the course followed by diseases due to hemoprotozoa; and (3) observations in bacterial infections, vaccination, and diagnostic reactions.

Immunisation against anthrax with a saponified culture, G. N. HALL (*Vet. Jour.*, 90 (1934), No. 11, pp. 446-454).—It was found that saponin added to virulent anthrax organisms and inoculated into cattle, sheep, and goats subcutaneously set up a local reaction which prevented generalized infection. In cattle the reactions are not sufficiently severe to prohibit this method of vaccination. A strong immunity is induced 10 days or less after vaccination.

Spontaneous encephalomyelitis of mice—a new virus disease, M. THEILER (*Science*, 80 (1934), No. 2066, p. 122).—In work by the Rockefeller Foundation individual mice with flaccid paralysis of the hind legs have been observed on numerous occasions during the past 2 yr. among the normal stock. The paralysis in surviving mice recedes gradually, although residual paralysis, usually of the hind legs, is almost invariable. Such mice were found to be virus carriers, the virus being recovered from the spinal cord for at least 150 days after injection. The virus resists the action of 50 percent glycerin at from 2° to 4° C. for at least 150 days and passes all grades of Berkefeld filters with ease. The virus is not pathogenic for rhesus monkeys, and no evidence was obtained of any immunological relationship with the virus of human poliomyelitis.

Pasteurella in animals and their inter-classification, I. A. B. KHALIFA (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 147 (1934), pp. 36).—A series of experiments extending over 4 yr. and conducted on several strains of *Pasteurella* isolated from animals subject to independent epizootics is said to have enabled the author to demonstrate the occurrence of distinguishable varieties within the *Pasteurella* group and to render proper typing and intergrouping possible.

The piroplasmoses of Carnivora and a new piroplasm from a feline (*Babesiella felis* [n. sp.] in the puma—*Felis concolor*) [trans. title], M. CARPANO, trans. by E. J. MORENO (*Egypt Min. Agr., Serv. Tech. et Sci. Bul.* 137 (1934), pp. 20, pls. 6).—This contribution is presented with 21 references to the literature.

A preliminary note on the use of the Nigerian method of making rinderpest vaccine for the prevention of rinderpest, C. S. Lo (*Lingnan Sci. Jour.*, 13 (1934), No. 2, pp. 257-259).—The use of a formalized vaccine for the prevention of rinderpest, prepared by the so-called "Nigerian method", has been found to be simple and effective. The vaccine was used after keeping at 4° C.

for 5, 7, 11, and 47 days, respectively. Immunity was produced at approximately 2 weeks' time. The inoculation of a large amount of virulent blood, 20 to 40 cc, from 12 to 52 days after the inoculation of the vaccine did not produce clinical symptoms of rinderpest.

On the cultivation of seven species of trypanosomes in vitro, A. PACK-CHANIAN (*Science*, 80 (1934), No. 2079, pp. 407, 408).—Notes are presented on the cultivation of *Trypanosoma* spp. and the infectivity and spontaneous attenuation of trypanosomes, both in vitro.

Natural and experimental infection of *Triatoma protracta* Uhler and mammals in California with American human trypanosomiasis, F. D. WOOD (*Amer. Jour. Trop. Med.*, 14 (1934), No. 6, pp. 497-517, pls. 3).—The blood-sucking reduviid bug *T. protracta* and the wood rat *Neotoma fuscipes macrotis* Thomas were found to be natural carriers of *Trypanosoma cruzi* Chagas in southern California. The following animals were experimentally infected with this trypanosome: Albino rats, albino mice, rhesus monkeys, a puppy, an opossum (*Didelphis virginiana virginiana* Kerr), two species of dusky-footed wood rats (*N. fuscipes annectens* Elliot and *N. fuscipes macrotis*), and five species of white-footed mice (*Peromyscus eremicus fraterculus* (Miller), *P. californicus insignis* Rhoads, *P. californicus californicus* (Gambel), *P. maniculatus gambeli* (Baird), and *P. truci gilberti* (Allen)). "The San Diego desert and southern parasitic mice and the Virginia opossum have all been found in wood-rat nests in the infected locality, so it is possible that they, too, are carriers."

Ulcerous dermatitis of ruminants and its relation to diphtheria of man.—First paper, M. CARPANO, trans. by E. TALAREWITCH (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 135 (1934), pp. 48, pls. 12).—The author reports having established the fact that there exists an affection in ruminants which is naturally determined by the true *Corynebacterium diphtheriae*. It is concluded that "ruminants suffering from ulcerous dermatitis must be considered as true reservoirs of the diphtheric virus, capable of transmitting the infection either by direct contact to persons in charge of their keeping and exploitation or by indirect contact by means of their milk and its byproducts (cream, milk foodstuffs, etc.), and thus determine, amongst the other cases of infection, those sporadic cases during interepidemic periods or in isolated localities, in the country for instance, where human diphtheria is very rarely observed or unknown entirely."

A four-page list of references to the literature is included.

An attempt to transmit yellow-fever virus by dog fleas (*Ctenocephalides canis* Curt.) and flies (*Stomoxys calcitrans* Linn.), M. HOSKINS (*Jour. Parasitol.*, 20 (1934), No. 5, pp. 299-303).—In work in Brazil, dog fleas did not transmit the virus of yellow fever to rhesus monkeys in interrupted feeding experiments, but fleas which had fed 7 hr. previously on an infected animal caused the death from yellow fever of a normal monkey into which they were injected. The virus was not demonstrable in the bodies of fleas 18 hr. after an infective blood meal.

"In an interrupted feeding experiment, biting stable flies (*S. calcitrans*) transmitted the virus of yellow fever to a rhesus monkey 6 hr. after the infective blood meal, but not 16 hr. after such a meal. Flies which had fed 42 hr. previously on an infected monkey caused the death from yellow fever of a normal monkey into which they were injected, but injections of flies 48 and 72 hr. after feeding did not produce yellow fever."

Parasites and parasitic diseases of cattle in Puerto Rico, H. L. VAN VOLKENBERG (*Puerto Rico Sta. Bul.* 36 (1934), pp. 26, figs. 4).—Following a discussion of the general characteristics and effects of parasites and general

parasite control measures, the diseases of cattle caused by protozoa, worm parasites, external parasites, and eradication of parasites are taken up.

Investigations respecting abortus infection in the udder of the cow [trans. title], H. O. PEDERSEN (*Skand. Vet. Tidskr.*, 24 (1934), No. 7, pp. 409-438; *Eng. abs.*, pp. 435-437).—An account is given of the employment of various aniline dyes in the cultivation of *Brucella abortus* from milk for the purpose of checking the development of saprophytic bacteria occurring therein. It was found that the addition of methyl violet 5 B (Grübler) to serum agar in the proportions of from 1:20,000 to 1:50,000 does not arrest the growth of *B. abortus*; at the same time the development of staphylococci, corynebacteria, and other Gram-positive rods is altogether stopped. On the other hand, this dye does not sufficiently arrest the development of streptococci.

The presence of Br. abortus in the uterine fluid and in the milk and of agglutinins in the blood sera of so-called ceased reactor cows, B. A. BEACH and G. C. HUMPHREY (*Vet. Med.*, 30 (1935), No. 1, pp. 8-10).—In observations at the Wisconsin Experiment Station of 14 cows which passed through an outbreak of Bang's disease and were held for observation for 2 yr., 11 were negative, or at most suspicious, during this period, while 3 at times were low reactors. The colostrum milk and uterine fluid failed to reveal *Brucella abortus*, with the exception of 1 cow in one quarter of the udder at one freshening only. "The colostrum milk serum showed antibody concentration of 1:400 or higher. After the animals had been milked a few days the titer had largely disappeared. This shows an antibody concentration in the udder during the nonlactating period."

Observations on the reinfection with Br. abortus of part of a dairy herd that had been infected five years previously, B. A. BEACH and G. C. HUMPHREY (*Vet. Med.*, 30 (1935), No. 1, pp. 10, 11).—In work at the Wisconsin Experiment Station, reinfection with *Brucella abortus* with one exception had little effect on the 13 cows in the herd. In no instance did a cow that aborted following initial infection abort on reinfection. The agglutinin titer of the blood with one exception was only slightly influenced, in spite of the fact that 11 of 22 stable mates aborted.

A study of preservatives for rapid-test Brucella abortus antigen, C. R. DONHAM and C. P. FITCH (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 6, pp. 782-787).—Of the preservatives used in a study of *B. abortus* antigen at the Minnesota Experiment Station, phenol in 0.5 percent concentration was the most suitable for rapid test preparations. "Refrigerator temperatures rather than room temperatures are important for preserving the sensitivity of such antigen preparations regardless of the type or concentration of preservative used. The addition of dyes (gentian violet and brilliant green) to rapid test antigen preparations tends to reduce their sensitivity after several months as compared to similar preparations without dye. Under good average conditions, no antigen preparation preserved in any of the ways employed in this experiment can be depended on to retain its sensitivity longer than about 6 mo."

A microfilaria in the blood of cattle, F. N. BELL (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 6, pp. 747-759, figs. 2).—The author has found microfilariae, thought to be the larval stage of *Setaria labiato-papillosa*, to occur in the blood of cattle in Wisconsin. The herds observed gave a high incidence of infection, and it is deemed to be quite common in the cattle in the State. The source of the infection is not known. A list is given of 25 references to the literature.

The types of leucocytes in market milk as related to bovine mastitis, G. C. HOLM (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 6, pp. 735-746, figs. 4).—This contribution reports upon a study made of the blood chlorides, milk

chlorides, leucocyte content, differential leucocyte content, and the causative or predominating organisms found in bovine mastitis, the details being presented in tabular form. A leucocyte content of 100,000 per cubic centimeter of milk as reported by Cherrington et al. (E. S. R., 69, p. 857) usually indicates mastitis. Small and large lymphocytes were the only types of leucocytes found in normal milk. Polymorphonuclear leucocytes, mononuclear leucocytes, and small and large lymphocytes were found in milk from cows having mastitis. Polymorphonuclear leucocytes are not a constituent of normal milk; therefore, their presence even in small numbers is indicative of mastitis.

A list is given of 18 references to the literature.

The viability of streptococci of mastitis, C. S. BRYAN (*Vet. Med.*, 29 (1934), No. 12, pp. 524-526).—In studies conducted at the Michigan Experiment Station, "alpha, beta, and gamma types of streptococci of mastitis manifested similar resistance to the devitalizing factors to which they were subjected. Streptococci of mastitis remained viable for (1) 66 days in sand when inoculated with broth culture and 66 days when inoculated with nutrient free suspension, (2) 8 days in soil when inoculated with broth culture and 10 days when inoculated with nutrient free suspension, (3) 8 days in burlap sacking when inoculated with broth culture and 8 days when inoculated with nutrient free suspension, (4) 66 days in tap water when inoculated with broth culture and 65 days when inoculated with nutrient free suspension, (5) 8 days in sterile tubes (4 drops) when inoculated with broth culture and 5 days when inoculated with nutrient free suspension. *Brucella suis* remained viable for (1) 120 days in sand, (2) 46 days in soil, (3) 5 days in burlap sacking, (4) 77 days in tap water, (5) 121 days when 4 drops were dried in sterile tubes."

Streptococcic contamination of dairy barns, C. S. BRYAN (*Vet. Med.*, 29 (1934), No. 9, pp. 384-387, *Ger. abs. pp. 386, 387; abs. in Michigan Sta. Quart. Bul.*, 17 (1934), No. 2, p. 84).—In work at the Michigan Experiment Station streptococci which were responsible for the infectious mastitis present in the dairy herd were recovered from the dust, litter, and bedding in the barn. Such streptococci could not be isolated from these materials 20 to 30 days after the continuous source of contamination, namely, infected cows eliminating streptococci in their milk, was removed. Cow stable dust, litter, and bedding from contaminated barns held at ice box temperatures yielded the infective streptococci for a period of more than a year. The findings suggest that physical factors largely determine the time of survival of such streptococci in the environment of the infected cow.

Stable sanitation in infectious mastitis, C. S. BRYAN (*Michigan Sta. Quart. Bul.*, 17 (1934), No. 2, pp. 76, 77).—The importance of stable sanitation in combating infectious mastitis is called to attention in a practical way.

Further studies on the survival time of the bovine tubercle bacillus in soil, soil and dung, in dung, and on grass, with experiments on feeding guinea-pigs and calves on grass artificially infected with bovine tubercle bacilli, E. C. G. MADDOCK (*Jour. Hyg. [London]*, 34 (1934), No. 3, pp. 372-379).—Following a brief discussion of the technic, the studies are reported in four parts, namely, (1) viability of bovine tubercle bacilli in soil, dung and soil mixtures, and in dung exposed in the open during 1932, (2) viability of bovine tubercle bacilli on grass growing in a pasture during 1932 and 1933, (3) feeding experiments with guinea pigs on pasture infected with bovine tubercle bacilli in 1932 and experiments in 1933 (effect on environment), and (4) feeding experiments with calves in 1933 (fed as in part 3, 1933).

In 1931 it was found that virulent organisms could be recovered from infected material (dung, soil and dung) exposed in the open for 178 days; in 1932 positive findings occurred irregularly up to 152 days. During the autumn

and winter of 1932 and 1933 winter tubercle bacilli were shown to survive for as long as 63 days after infection of the grass growing in a pasture. In feeding experiments with guinea pigs grazed on pasture grass infected with bovine tubercle bacilli in 1932 there was no trace of tuberculosis after 20 mo. In experiments in 1933 it was possible to infect calves by feeding on grass that had been infected four times at monthly intervals with emulsions of tubercle bacilli.

Two diseases of sheep of economic importance in South Australia, C. T. McKenna (*So. Aust. Dept. Agr. Bul.* 289 (1933), pp. 11).—Parasitic gastro-enteritis of sheep and the parasites which cause it and infectious enterotoxemia of sheep are here considered.

Paratuberculosis in sheep and goats [trans. title], F. V. HOLMBOE and L. SLAGSVOLD (*Skand. Vet. Tidskr.*, 24 (1934), No. 10, pp. 573-585; *Eng. abs.*, p. 585).—A description is given of several cases of paratuberculosis or Johne's disease in the goat and in one case in the sheep as observed in Norway.

Rinderpest in sheep, with a special reference to artificial infection, G. N. Srikanthiah (*Indian Vet. Jour.*, 11 (1934), No. 2, pp. 104-108, pl. 1).—The author finds sheep to be highly susceptible to artificial infection of rinderpest, and that the virus is exalted when passed through their bodies. Prophylactic inoculation against the disease with goat-adapted virus alone was not safe for sheep, a dose of antiserum having to be given simultaneously with either bovine or goat virus. Natural occurrence of the disease in sheep is rare, and when an outbreak occurs it may precede or follow an outbreak among cattle, simultaneous occurrence being rare.

The genus *Salmonella* Lignières 1900: Issued by the Salmonella subcommittee of the nomenclature committee of the International Society for Microbiology (*Jour. Hyg. [London]*, 34 (1934), No. 3, pp. 333-350).—The subcommittee submits a scheme of classification of the genus *Salmonella* in the perfection of which so far as possible it has adhered to the International Rules of Botanical Nomenclature. It is pointed out that the genus was erected by Lignières in 1900, who employed the name for the organisms of the hog cholera or intermediate group of the intestinal bacteria, the type species being fixed by him in 1901 as the hog cholera bacillus of Salmon. A list is given of 44 forms recognized by the subcommittee and a 3-page list of references to the literature.

Swine erysipelas, R. A. McIntosh (*Cornell Vet.*, 24 (1934), No. 4, pp. 325-330, figs. 2).—A practical account of swine erysipelas which includes a brief description of an outbreak of the disease observed by the author.

Pseudorabies as a contagious disease in swine, R. E. Shope (*Science*, 80 (1934), No. 2065, pp. 102, 103).—Further studies (E. S. R., 69, p. 266) indicate that in pseudorabies in swine the nose serves as the portal for the entrance and exit of the virus. "They suggest that swine may be an important reservoir for the maintenance of pseudorabies infection because of the facts that the disease in swine is highly contagious, that it is not fatal for this species among all its hosts, and that it is of so mild and ill-defined a nature that it may escape notice, or, if it is noted, be incorrectly diagnosed. It is readily conceivable that the escape of this virus from its swine reservoir may be responsible for the sporadic and highly fatal cases of pseudorabies among cattle in the swine-raising States of the Middle West."

Dourine in South Africa, K. C. A. Schulz and J. J. G. Keppel (*Farming in So. Africa*, 9 (1934), No. 104, pp. 454, 457, figs. 3).—This is a summary of information on dourine, one of the most important diseases to which equines in the Union of South Africa are subject.

Incidence of equine encephalo-myelitis in an Indian cavalry regiment (*Jour. Roy. Army Vet. Corps*, 5 (1934), No. 4, pp. 159-172, fig. 1).—This is a report of an outbreak which took place in the winter of 1933, in which 71 cases occurred with a mortality of 20.58 percent. The history of the outbreak was compiled by H. S. Mosley (pp. 159-162); clinical observations, treatment and experiments in the field, etc., are considered by C. W. Heane (pp. 162-168), and pathological investigation by J. F. Shirlaw (pp. 168-172).

Temporary prevention by chemical means of intranasal infection of mice with equine encephalomyelitis virus, P. K. OLITSKY and H. R. COX (*Science*, 80 (1934), No. 2085, pp. 566, 567).—In the further studies here reported (*E. S. R.*, 71, p. 702), it was found "possible to induce a transient resistance in mice to intranasal infection with two strains of equine encephalomyelitis virus by prior applications of tannic acid to the nasal mucosa."

Experiments with equine infectious anemia [trans. title], G. RAMON and E. LEMÉTAYER (*Compt. Rend. Acad. Sci. [Paris.]*, 198 (1934), No. 5, pp. 508-510).—This brief account presents information on the etiology, pathology, and immunology of the disease. It was found in preliminary work with the horse that while the animal worked with was resistant to severe experimental infection and immune to the disease its blood serum failed to convey any immunity to other animals and even to transmit a fatal infection. Work with formalized vaccine gave negative results.

Experimental studies on the curative treatment of surra in native horses in the Philippines, I. L. M. YUTUC (*Philippine Jour. Sci.*, 54 (1934), No. 1, pp. 9-27).—Experiments conducted to determine the value of etharsanol and Naganol, alone and in combination in native horses affected with surra, are reported in connection with a list of 23 references to the literature.

It was found that "the monosodium preparation of etharsanol is useless against equine surra. The free-acid etharsanol to a certain degree can control artificial infection, provided the cerebrospinal fluid is free of the surra trypanosomes. On the other hand, where there is already cerebrospinal involvement, its value is very limited as far as permanent recovery is concerned.

"In the use of Naganol against artificially infected horses, it has been observed that so long as the fluid of the cerebrospinal system is free of the surra organism it is safe to state that infection can be controlled permanently. However, with the involvement of the nervous system, Naganol has limited value. In the 4 horses artificially infected and with positive cerebrospinal fluid, the drug was a complete failure.

"Attempts to determine the length of time the surra trypanosome appeared in the cerebrospinal fluid after its appearance in the peripheral circulation were made on 17 horses artificially infected with surra organisms. The results were variable. Ten of the 17 animals were positive and the remainder negative. The average period before the fluid of the central nervous system was positive was 12.2 days, the minimum was 5 days, and the maximum 22 days. On the other hand, among horses with negative cerebrospinal fluid, the average period was 9.14 days, the minimum was 4, and the maximum 15. This finding invariably limits the value of either etharsanol [or] Naganol as trypanocidal agents when given alone and intravenously.

"By administering both etharsanol and Naganol in nonlethal but slightly toxic doses and in simultaneous injections, 3 experimental surra horses with positive cerebrospinal fluid and 6 of 10 naturally infected animals were cured. Some of the results of the experiments indicate that there is a synergistic relation between the two drugs used, which is possibly responsible for the complete sterilization of the cerebrospinal fluid concurrently with the circulatory system. Lastly, the simultaneous injection of etharsanol and Naganol is far

superior to the use of either of the two drugs given alone and intravenously for the treatment of equine surra."

Contribution to the study of the virus of Aujeszky's disease [trans. title], P. REMLINGER and J. BAILLY (*Ann. Inst. Pasteur*, 52 (1934), No. 4, pp. 361-405).—This contribution reports upon the species susceptible, including the symptomatology of the experimental disease, routes of infection, pathological anatomy, and the differentiation of infectious bulbar paralysis from rabies.

Pure cultivation of the filtrable virus isolated from canine distemper, M. SHOETENSACK (*Kitasato Arch. Expt. Med. [Tokyo]*, 11 (1934), No. 4, pp. 277-290, pl. 1).—This is a report of experimental work with a virus obtained in solid culture media from nasal secretion, lung, and liver in many cases of dogs with typical respiratory type of distemper. This virus resembles *Asterococcus mycoides*, the causative agent of lung plague or pleuropneumonia of cattle, in its morphology and staining properties.

Dr. Little's dog book, G. W. LITTLE (*New York: Robert M. McBride & Co.*, 1934, rev. ed., pp. XXVI+345, pls. 33, figs. 7).—This is a new and revised edition of the work previously noted (E. S. R., 52, p. 886).

Poultry ailments, W. P. BLOUNT (*London: Poultry World, Ltd.*, [1934], pp. X+306, figs. 40).—A practical account dealing with the dietetics, physiology, and affections of the fowl.

The present status of our knowledge of coccidiosis in chickens, R. L. MAYHEW (*Poultry Sci.*, 13 (1934), No. 5, pp. 296, 297).—This contribution from the Louisiana Experiment Station, presented at the twenty-sixth annual meeting of the Poultry Science Association held at College Station, Tex., in August 1934, briefly reviews the life cycle of the causative organism, prevention, treatment, effects of an early attack on egg production, and resistance or immunity.

Studies on coccidiosis.—VII, Effects of starvation and removal of caeca, R. L. MAYHEW (*Poultry Sci.*, 13 (1934), No. 6, pp. 360-369, figs. 6).—In this further contribution (E. S. R., 71, p. 539) from the Louisiana Experiment Station, the author describes a method employed in removing surgically the ceca from chickens.

It was found that the absence of the ceca causes no apparent permanent effect on the growth of young chickens. It was demonstrated that coccidiosis, on the other hand, retards the attainment of normal weight for longer than 3 mo. after the attack. "Data on the effects of cecectomy on egg production are presented, and the conclusion seems justified that the absence of the ceca does not interfere with egg laying. It has been demonstrated that coccidiosis has considerable effect on egg production. Data are presented which show that the operation of cecectomy performed on layers has no permanent effect upon weight and egg production. Results are described which (it is believed) show that removal of the ceca of chickens will not prevent coccidiosis. The conclusion is reached that the injurious effects resulting from coccidiosis are not due to a destruction of the function of the ceca resulting from hemorrhage; hence, methods of treatment should not be directed along this line. The effect of coccidiosis on growth and weight is not due to the failure to eat during the period of sickness."

Studies on coccidiosis.—VIII, Immunity or resistance to infection in chickens, R. L. MAYHEW (*Jour. Amer. Vet. Med. Assoc.*, 85 (1934), No. 6, pp. 729-734).—In continuation of the studies noted above, evidence is presented that suggests the possibility of isolation of families or strains highly susceptible or slightly susceptible as indicated by the relative number of deaths and cases of hemorrhage. "The results of the inoculations of birds with previous history of infection indicate the lack of development of a protective resistance which can be made use of in a practical manner at the present time. That an age immunity or resistance is not acquired is indicated by the development of typi-

cal cases of coccidiosis in birds inoculated at various ages between 4 and 40 weeks."

Cross-infection experiments on parasite-free chicks with intestinal coccidia from the rabbit, K. B. M. CROOKS (*Jour. Parasitol.*, 20 (1934), No. 5, pp. 277-279).—Baby chicks that were fed large doses of sporulated oocysts of rabbit coccidia did not show any evidence of coccidial infection. *Eimeria media*, described from California rabbits in 1931 by Kessel and Jankiewicz (*E. S. R.*, 66, p. 670), was obtained from Virginia rabbits that had died from coccidiosis. Baby chicks that were fed daily with small doses, and one with large doses, for three consecutive days showed no evidence of coccidial infection.

New observations on the culture of fowl pest [trans. title], H. PLOTZ (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 25, pp. 956, 957).—This contribution supplements earlier studies on the cultivation of the virus of fowl pest.

Fowl-plague in Egypt, A. M. RACHAD (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 140 (1934), pp. 22; *Sup.*, pls. 8).—The author has found that fowl pest (fowl plague) in Egypt, which causes a mortality of from 90 to 100 percent of the infected fowls, does not differ from the ordinary form found in other countries. A list is given of 44 references to the literature.

Proventriculitis in chickens due to flukes, I. E. NEWSOM and E. N. STOUT (*Vet. Med.*, 28 (1933), No. 11, pp. 462, 463, figs. 2).—The fluke *Psilostomum ondatrae* Price, described in 1931 from a muskrat and from a California gull, is reported to have been the cause in August 1933 of the death of 29 of 42 8-week-old White Leghorn chickens on a farm near Craig, Colo., and of 1 of a lot of Rhode Island Red chickens of the same age on the same farm. Later, a similar trouble was found to have been experienced on a farm a mile distant where 8 Plymouth Rock pullets had died.

In an examination made of affected birds in these two flocks, a very noticeable enlargement of the proventriculus and a deep reddening around the orifices of the glands were observed. In the more extreme cases there appeared to be a grayish exudate on the surface, simulating ulceration. It appeared from the microscopic examination that the flukes had not burrowed into the glands themselves but had produced the irritation by their presence on the surface of the mucous membrane. The total losses were given as 32 in the first flock and 10 in the second.

Present status of pullorum disease, H. VAN ROEKEL (*New England Poultryman and Northeast. Breeder*, 18 (1934), No. 10, pp. 20, 29, 34).—In this contribution from the Massachusetts Experiment Station it is pointed out that eradication work with pullorum disease is partly or entirely under State regulatory supervision in 26 States, while in the remaining 22 the work is conducted by State experiment stations, State extension services, and practicing veterinarians.

"Considerable variation was found to exist regarding the testing method employed, disposition of reactors, official grade terms applied to tested flocks, and official control over advertising. The total number of birds tested for the 1932-33 season by State agencies or those under State supervision was 3,315,600. The average percentages of reactors ranged from 0 to 18.4. Two-thirds of the total tested birds reported are found in the Eastern States.

"A 6-yr. testing summary for 13 Eastern States shows that the total number of tests has increased from 735,851 to 1,597,025. The percentage of positive tests has decreased from 3.1 to 1.2. The number of negative flocks (100 percent tested) has increased from 372 to 1,120."

A comparison of the routine rapid whole blood (stained antigen) and the routine rapid serum agglutination tests for pullorum disease, J. BIELY and W. ROACH (*Canad. Jour. Res.*, 10 (1934), No. 6, pp. 798-806).—In continua-

tion of earlier studies (E. S. R., 68, p. 677) the authors report upon 4,429 birds, comprising 8 flocks, which were given the whole blood agglutination test and the rapid serum agglutination test. The diagnoses agreed in the cases of 4,046 birds as disease free and 261 as infected.

Of the 122 birds in which there was a disagreement, 43 were diagnosed as positive by the whole blood agglutination test and negative by the rapid serum agglutination test, while 79 were diagnosed as positive by the rapid serum agglutination test and negative by the whole blood agglutination test. When 102 of these 122 birds were retested, there was a closer agreement between the diagnoses made on the basis of the whole blood agglutination and the rapid serum agglutination tests than between those made on the basis of the rapid serum agglutination test in two laboratories (71.56 and 65.34 percent, respectively). A detailed study of the retests and post-mortem examination of the 102 birds is presented.

Fourteenth annual report on pullorum disease eradication in Massachusetts, 1933-34, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 73 (1934), pp. 8).—In this annual report on the results of pullorum disease testing for the 1933-34 season (E. S. R., 70, p. 392) an effort is said to have been made to point out such factors as have been overlooked as well as those that have been observed in eradicating pullorum disease from the flock. During this period 262 flocks with 284,916 chickens in 12 counties were tested, of which 0.53 percent gave positive reactions to the pullorum infection.

The results of Government combat of pullorum disease and avian tuberculosis in Hungary in 1928-32 [trans. title], R. MANNINGER (*Berlin. Tierärztl. Wchnschr.*, 50 (1934), No. 12, pp. 210-213; *abs. in Vet. Rec.*, 14 (1934), No. 41, p. 1234).—An account is given of a voluntary and successful plan worked out by the Department of Agriculture of Hungary in an effort to eradicate pullorum disease and tuberculosis from poultry flocks and the results achieved during a period of 5 yr.

Immunity in Rous fowl sarcoma and its bearing on the problem of the nature of normal and cancerous growths, M. J. A. DES LIGNERIS (*So. African Inst. Med. Res. Pubs.*, No. 31 (1934), pp. 193, figs. 85).—This contribution is presented in connection with a list of six pages of references to the literature.

A note on pathological changes encountered in wild ducks, J. P. TORREY, F. THORP, JR., and R. GRAHAM (*Cornell Vet.*, 24 (1934), No. 4, pp. 289-298, figs. 5).—Wild ducks that died in large numbers on an island in the Illinois River near Beardstown, Ill., during the fall of 1933 were found upon examination to carry lesions of pneumomycosis and microfilaria in their blood stream. *Aspergillus* species injected intravenously into young chicks caused death, and gross mycotic pulmonary lesions were visible in intravenously inoculated chicks which died within a week following injection but were not visible in chicks killed 3 weeks after subcutaneous and intralaryngeal exposure to *Aspergillus* species. Gross mycotic lesions in the lungs of intravenously injected chicks were confirmed by histopathological examination. No significance was attached to the presence of microfilaria.

Cause of mortality of young grouse, C. H. D. CLARKE (*Science*, 80 (1934), No. 2071, pp. 228, 229).—Field studies at Algonquin Park, Ontario, in the summer of 1934, are said to have shown that a mortality of at least 60 percent among grouse (*Bonasa umbellus togata*) chicks had taken place in mid-July in the area under immediate observation. In practically all adult and young birds examined a *Leucocytozoon* was found to be present. Since similar parasites are known to be lethal to ducks and turkeys, a connection between its occurrence in grouse and the high mortality observed is suspected.

Fleas and anaemia in foxes, R. G. LAW and A. H. KENNEDY (*Ontario Game and Fisheries Dept. Ann. Rpt.*, 27 (1933), pp. 15-18).—The finding that fleas were responsible for a severe anemia in foxes at the Ontario Government Experimental Fur Farm is reported. The results of red blood corpuscle counts and hemoglobin percentage findings in 10 animals are presented in tables.

Lungworm in foxes—its control and treatment, K. B. HANSON (*Vet. Med.*, 29 (1934), No. 1, pp. 12-16).—A practical summary of information on lungworms in foxes, of which *Capillaria aerophila* is the species most common on fox farms in the United States.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies by the Missouri Station] (*Missouri Sta. Bul.* 340 (1934), pp. 15-21, figs. 4).—Data are reported as to plans for a combination milk house and milking room and a machine shed and horse barn, a 3-horse hitch for wagons, and the spacing of tile drains on Missouri soils, all by J. C. Wooley; dairy refrigeration studies, hotbed heating, and electric brooding, by R. R. Parks; power, labor, and machinery costs on 66 Linn County farms and tests of corn planter fertilizer attachments, by M. M. Jones and D. D. Smith; the determination of the efficiency of energy transformations in the horse, by Jones and S. Brody; and the capacity of silos, by Jones and Smith.

[Agricultural engineering investigations at the Wisconsin Station] (*Wisconsin Sta. Bul.* 428 (1934), pp. 62-64, 72, 73, fig. 1).—The progress results of studies on the factors causing differences in the severity of soil erosion and on the development of a header for harvesting reed canary grass seed are briefly presented.

The influence of the diameter of a cylindrical well upon the quantity of water produced, W. GARDNER and C. AFFLECK (*Agr. Engin.*, 15 (1934), No. 10, pp. 353, 354, fig. 1).—This is a highly technical analysis.

Development of the porous hose method of irrigation in Michigan, O. E. ROBEY (*Agr. Engin.*, 15 (1934), No. 8, pp. 282, 283).—A brief historical account of the development of this method of irrigation in Michigan is presented as a contribution from the Michigan Experiment Station. Some cost data are included.

The durability of mole drains, H. H. NICHOLSON (*Jour. Agr. Sci. [England]*, 24 (1934), No. 2, pp. 185-191, pls. 2).—In a contribution from Cambridge University a statistical analysis is presented of data from 80 selected farms in an effort to correlate mole drain durability with the physical properties of the soils.

The data indicate that the physical constitution of the soils is the most potent factor in the deterioration of mole drains. Apparently the presence of even a few sandy or gravelly patches in the clay may be a cause of weakness in the whole system.

Studies of plaster casts of mole drains in clay soil showed that the plaster cast method is very useful in following and recording the changes and decay to which such drains are subject. It would appear that fissuring, the very factor which is most potent in ameliorating the drainage of heavy clays, is the chief cause of the decay of the mole channels. Whether these fissures are produced naturally by the drying out and the contraction of the clay or artificially by the disruptive effects of deep tillages or of mole draining, the effects are similar.

"Turning to the effects of mole draining operations, it would appear that the upheaval and tearing effect which is apparent as the mole plow proceeds is all to the good to the extent to which it occurs between the soil surface and the mole channel. A comparatively permeable strip of soil is produced to about 18 or 24 in. on either side of the mole slit, and this must make it easier for excess water at the surface to find its way into the mole channels. Fissuring in the walls of the channel itself, however, cannot be so favorably regarded, as it must be a cause of weakness and of earlier collapse of the walls. It would appear that such fissuring may be due to various causes. The presence of small stones or gravel in the clay subsoil is undoubtedly one, while another is the angle which the cartridge makes with the surface of the soil. The greater this is, the more numerous and substantial are the fissures in the wall of the channel."

Moisture equivalent, field capacity, and permanent wilting percentage and their ratios in heavy soils, R. A. WORK and M. R. LEWIS (*Agr. Engin.*, 15 (1934), No. 10, pp. 355-362, figs. 3).—Studies conducted at the Oregon Experiment Station in cooperation with the U. S. D. A. Bureau of Agricultural Engineering are reported which relate to soil moisture constants and their ratios as determined for slightly pervious clay soils. Irrigation experiments were initiated on two orchards in 1930 and conducted throughout that and the two following years. During 1932 additional and more detailed experiments dealing with soil moisture and the response of pear trees thereto were started at the Medford Branch Station.

It was found that in soils that appear uniform in structure and texture differences may exist that are not readily discernible in casual examination. Study of soil moisture constants at increasing depths below the soil surface will interpret these differences in terms of maximum available moisture. With the soils studied, the maximum available moisture content generally decreased with depth.

With these soils moisture equivalent generally increases with depths to 3 ft., but on the Klamath and Medford station soils (Meyer clay adobe) field capacity usually decreases with depth. In the Medford soils the moisture equivalent is not equal to field capacity. In the 0 to 3-ft. average of the three orchards for two heavy soil types, field capacity equaled only 0.83 of the moisture equivalent. Determinations show the permanent wilting percentage to increase with depth with Meyer silty clay loam but to remain about the same or with a slight tendency to increase with depth at depths from 0 to 3 ft. with Meyer clay adobe soil.

The data show that moisture equivalent-permanent wilting percentage ratio derived from any particular depth of soil cannot be applied exactly to any other horizon. The ratios for the averages of all plats and half plats in the three orchards are for the first foot 2.10; for 1 to 2 ft., 2.17; and for 2 to 3 ft., 2.19.

The results show that a field capacity-permanent wilting percentage ratio derived from any one soil level cannot accurately be applied to any other soil level. The ratios for the averages of all plats and half plats in the three orchards are for the depths 0 to 1 ft., 1.93; 1 to 2 ft., 1.76; and 2 to 3 ft., 1.68. The field capacity-permanent wilting percentage ratio decreases with depth, but the moisture equivalent-permanent wilting percentage ratio increases with depth.

In general, for the 0 to 3-ft. average the data show that the field capacity-permanent wilting percentage ratio is less subject to variation from a mean in adjoining plats or in plats not adjoining but on similar soil types than the moisture equivalent-permanent wilting percentage ratio.

The data indicate that, with the soils studied, for practical orchard operation in which it is important to know the approximate field capacity and available moisture capacity of the soil in the major portion of the root zone, the field capacity may be readily determined and the permanent wilting percentage for the 0 to 3-ft. average may be approximated by dividing field capacity by the factor 1.76. If for any particular reason greater accuracy is desired, the ratio found for each foot of depth should be used.

Floods and accelerated erosion in northern Utah, R. W. BAILEY, C. L. FORSLING, and R. J. BECRAFT (*U. S. Dept. Agr., Misc. Pub. 196 (1934), pp. [2]+21, figs. 9*).—The studies reported in this publication were conducted by the Intermountain Forest and Range Experiment Station in cooperation with the Utah Experiment Station and the geology department of Utah State Agricultural College. The purpose is to present geologic evidence of flood damage and to point out that the recent floods in northern Utah constitute abnormal run-off and accelerated erosion, thereby marking a radical change from the normal rate of gradation of the present geologic epoch and climate. Evidence also is presented tending to show that this condition can be attributed chiefly to the depletion of the plant cover on the watersheds of the drainages involved.

Pile trestles as channel obstructions, D. L. YARNELL (*U. S. Dept. Agr., Tech. Bul. 429 (1934), pp. 26, pls. 4, figs. 7*).—This bulletin presents the results of 1,082 experiments on the effect of clean pile trestles in obstructing the flow of water which were conducted by the U. S. D. A. Bureau of Agricultural Engineering in cooperation with the University of Iowa. The purpose of the tests was to determine the coefficients for use in certain hydraulic formulas for calculating the backwater caused by such obstructions. The tests were conducted on both small size models and on full size single and double track pile trestles.

The results showed that the amount of obstruction to flow offered by pile trestles may be determined through the use of the proper trestle coefficient in any of the approved formulas. The detrimental effect of setting trestle bents at an angle with the current is less than might be expected. Little decrease in the coefficient, and hence in discharge, occurs unless the angle of the bent with the current exceeds 10° . The discharge coefficient for trestle bents set at a 30° angle with the current is about 4 percent less than that for bents parallel to the current. Some beneficial effect can be obtained by setting trestle bents in echelon if a roadway must cross a stream at an angle. If the axis of the roadway is at a 60° angle with the current and the bents are set in echelon, the Nagler and D'Aubuisson coefficients are about 5 percent greater than those for the same trestle crossing the stream at right angles to the current and the bents parallel to the current.

The pile trestle coefficients recommended for use in bridge pier formulas are as follows:

Pile-trestle coefficients recommended for use in bridge-pier formulas

Arrangement of trestle	Pile-trestle coefficients		
	D'Aubuisson $K_{D'A}$	Nagler K_N	Rehbock δ_0
Bents in line with current:			
Single-track 5-pile trestle bent.....	0.99	0.90	5.77
Double-track 10-pile trestle bent.....	.87	.82	11.90
2 single-track 5-pile bents off-set.....	.85	.79	13.00
Bents at angle with current:			
Single-track 5-pile trestle bent at—			
10° angle.....	.99	.90	5.70
20° angle.....	.96	.89	7.50
30° angle.....	.92	.87	9.30

Appendixes include an analysis of the D'Aubuisson formula and a comparison of the accuracy of the D'Aubuisson, Nagler, and Rehbock formulas.

Report of the Chief of the Bureau of Public Roads, 1934, T. H. MACDONALD (*U. S. Dept. Agr., Bur. Pub. Roads Rpt., 1934, pp. 62*).—This report covers the work of the bureau during the year on road construction under the Federal-aid road construction acts and under emergency provisions. It also reports the progress of studies of costs of construction and of physical researches related to highway design.

Supplement No. 1 to Federal legislation and regulations relating to highway construction under the National Industrial Recovery Act, Federal aid and National forest roads, flood relief, and miscellaneous matters, compiled by the Bureau of Public Roads (*U. S. Dept. Agr., 1934, pp. 14*).—This is a coded text of the legislation supplementing that previously noted (*E. S. R., 70, p. 839*).

Some tests of load capacity of floors made with precast concrete joists, R. E. COPELAND and P. M. WOODWORTH (*Jour. Amer. Concrete Inst., 5 (1934), No. 4, pp. 311-324, figs. 8*).—This is a progress report of an investigation of the structural performance of a floor construction consisting of precast reinforced concrete joists with cast-in-place or precast 2- or 2.5-in. reinforced concrete slab.

The purpose and scope of the tests so far made are (1) investigation of the influence of proportions, consistency, type, and grading of aggregate on placeability, strength, and appearance of the concrete; (2) tests on 27 specimens to determine the shearing strength at the joint with bond effected by different means; and (3) uniform loading of 12 panels 14 by 4 ft. and 4 panels 14 by 2 ft. to determine deflection at midspan, strains in concrete and tensile steel, and the general behavior of the panel with load increase.

This study and later experience in casting 32 joists 14 ft. 8 in. long demonstrated that satisfactory results can be obtained with hand spading and suitable concrete mixtures. Because of the greater shrinkage, however, with the wet consistencies, large amount of fine aggregate, and richness of mix necessitated by this method of placing, the use of mechanical means of compacting should receive consideration.

The tests of joint strength showed that joint strengths produced with concrete bond ranged from 250 to 340 lb. per square inch of bonding area. Metal ties of any substantial type increase the joint strength remaining after fracture of the concrete bond. With the particular joist design investigated, the strength of joists with concrete bond may be expected to be from 5 to 6 times the horizontal shear allowed with plain anchorage and from 3.3 to 4 times the shear allowed with special anchorage.

The performance and results as to load capacity, deflection, and measured stresses of panels with slab and joist connected with a concrete bond, with or without metal ties, indicated sufficient joint strength and interaction between slab and joist as to permit the use of the usual flexure formulas and allowable working stresses for T-beams in the design of floors of this type. Panels with monolithic slab and concrete bond gave ratios of ultimate load capacity to maximum design live load of 85 lb. per square foot, ranging from 2.8 to 3.7. With all panels tested the deflection at design load was substantially less than $\frac{1}{360}$ of the span length. There appeared to be no great difference in performance or results with different types of reinforcements. Results and performance of panels with joists made with different types of concrete compared so closely as to indicate that the type of aggregate of the joist concrete is not an important factor. For the range of conditions studied, strength of slab concrete had no marked effect on the ultimate load capacity of the floor construction. While metal ties of the type used may be regarded as desirable

supplemental connections, their use did not increase load capacity over that obtained with concrete bond alone.

New ideas in the construction of low-cost concrete floors, W. G. KAISER (*Agr. Engin.*, 15 (1934), No. 9, pp. 327-329, figs. 5).—Technical information is given on the use of precast concrete joists in floor construction, together with data on laboratory strength tests.

Floor panels with stressed plywood coverings, G. W. TRAYER (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab.*, 1934, pp. 10, figs. 3).—Tests are reported in which panels were used consisting of relatively shallow joists to the top of which plywood suitable for a subfloor was nailed and glued, and to the bottom of which thinner plywood, to serve as a ceiling in lieu of plaster, was also nailed and glued. The panels were tested over a span of 13.5 ft. with load applied at the third points.

The results indicate that floor panels made with stressed top and bottom coverings, such as with plywood glued to joists to form a box girder, can be made with satisfactory strength and stiffness. For a panel length of 14 ft. a joist height of 5% in. appears suitable, which means an appreciable reduction in the thickness of the floor system aside from any consideration of less material and labor costs. In order to obtain sufficient stiffness in panels over 14 ft. in length a joist depth greater than 5% in. or thicker plywood than that used in the tests would be required, although the former would furnish the added stiffness with less material. The stiffness of floor panels made in the fashion described can be calculated with reasonable accuracy by neglecting the plies of the coverings that run at right angles to the length and by using five-sixths of the modulus of elasticity for the wood of which the plywood is made, based on corresponding moisture content values.

The bending of wood, T. R. C. WILSON (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab.*, 1933, pp. 12, figs. 3; also in *Wood Prod.*, 11 (1933), Nos. 10, pp. 11, 12, figs. 3; 11, pp. 13, 14, 16, figs. 5; 12, pp. 13, 14, figs. 2).—Technical information is presented on the process of bending wood for various purposes.

Painting exterior woodwork, F. L. BROWNE (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab.*, 1934, pp. 5, pls. 2).—Practical information on the subject, based on studies at the U. S. D. A. Forest Products Laboratory, is presented briefly.

Durability of paint on wood treated with zinc chloride, F. L. BROWNE (*Amer. Wood-Preservers' Assoc. Proc.*, 30 (1934), pp. 410-430, figs. 3).—The painting characteristics of wood treated with zinc chloride for preservation against decay were studied at the U. S. D. A. Forest Products Laboratory by observation of practical installations and by a carefully planned series of exposure tests in which matched specimens of wood were used with and without treatment. For interior surfaces the presence of as much as 1.5 lb. per cubic foot of zinc chloride in boards 1 in. thick does not affect the behavior of interior flat or gloss paint significantly. For exterior surfaces it is entirely practicable to maintain zinc-treated wood with ordinary linseed oil paints, but the paints do not last so long on wood containing zinc chloride as they do on untreated wood. When wood treated with zinc chloride is primed with aluminum paint before applying ordinary white paint, the durability of the coating is greatly improved. Wood treated with a mixture of 2 parts of zinc chloride and 1 part of sodium dichromate by weight holds paint fully as well as similar but untreated wood. Since at least half of the zinc chloride in such a mixture must remain in the wood as such and whatever zinc dichromate is formed by the rest of the mixture is toxic in laboratory tests, the mixture offers promise as a wood preservative, although service tests to determine that point are lacking. The mixture of zinc chloride and sodium

dichromate may be given serious consideration for uses in which preservation is necessary and maximum economy in paint maintenance is desired, and where service records proving satisfactory effectiveness as a preservative are not considered essential.

Ferrous metals: Their treatments and properties for agricultural machinery, H. BORNSTEIN (*Agr. Engin.*, 15 (1934), No. 8, pp. 276-279, figs. 4).—This is a technical analysis of alloying and heat treatment of ferrous metals for use in farm machinery parts.

Farm and machine (*Farm and Machine* [*Inst. Res. Agr. Engin., Univ. Oxford*], 1 (1934), pp. 94, pls. 5).—This publication comprises the report of the Institute for Research in Agricultural Engineering of the University of Oxford for the year ended September 1933 and miscellaneous papers based on research by the institute on tractor developments in 1933, stationary and portable engines for farm work, pneumatic tires for farm carts, haymaking and harvesting development, survey of mechanized farms, St. John's College Farm at Long Wittenham, the needs of the farmer and the responsibility of electricity supply undertakings, electric motors for farms, sulfuric acid spraying in 1933, and alternatives to mole draining.

A brief description of agricultural engineering research agencies throughout the world is included, together with an abridged tractor data sheet.

Harvesting alfalfa with a windrow pick-up baler, J. B. DAVIDSON and W. H. CARTER (*Iowa Sta. Bul.* 322 (1934), pp. 201-216, figs. 8).—This bulletin reports the results of experiments in 1933 with a windrow pick-up baler. It was found that excellent quality hay may be made with this machine.

In the tests efficiency in the operation of the baler was found to be largely dependent upon two factors—(1) a windrow of sufficient size to furnish hay at a rate near the capacity of the machine but not so fast as to necessitate stops, and (2) the skill of the operators, particularly of the feeder and the bale tier.

An estimate of the cost of baling when 1.59 tons per hour were baled was \$2.17 per ton. Increasing the capacity to 2.75 tons per hour lowered the estimated cost to \$1.42 per ton. An average of 4.5 hp. was required from the power take-off of the tractor to operate the baler. A drawbar pull of 850 lb. was required to draw the baler on level ground. In operating the baler an independent clutch for the power take-off would be very convenient. An auxiliary engine to operate the baler would furnish the same advantages.

Hay baled directly from the windrow will store satisfactorily if the water content is sufficiently low. Hay containing as much as 23 percent moisture can be baled with reasonable safety, although under some conditions there might be sufficient heat developed to result in a loss of color and a lowering of the grade. The windrow pick-up baler presents a good opportunity for saving a large proportion of the leaves of the alfalfa plant.

Machinery for applying atomized oil spray, O. C. FRENCH (*Agr. Engin.*, 15 (1934), No. 9, pp. 324-326, 329, figs. 11).—The results of tests of the compressed air and blower types of oil spraying machinery conducted at the California Experiment Station are reported.

The compressed air sprayer tests showed that the relationship between air pressure and globule size is a straight-line function. As the pressure was increased the globule size decreased, as did also the range of globule sizes. Very little difference in average globule size resulted when oils of two different viscosities, namely, 35 and 60 saybolt seconds at 100° F., were used.

The results with the blower sprayer showed that as the oil pressure is increased from 30 to 100 lb. per square inch the globule size increases from an average of 90 up to 107 microns.

Application of steam in the sterilization of soils, A. H. SENNER (*U. S. Dept. Agr., Tech. Bul. 443 (1934), pp. 20, figs. 5*).—A description of common methods of steam sterilization of soils and the physical principles involved in steam sterilization is followed by an account of an investigation the objects of which were to determine the effect of initial steam pressure on the final moisture content of the soil, the final temperature of the soil, the quantity of steam needed, and the effect of the available horsepower on the task of soil sterilization. The tests were conducted out-of-doors on a plat of selected soil consisting of a brown fine sandy loam mixed with well-rotted horse manure, so as to approximate a soil frequently found in greenhouses.

The results showed that it is not possible to obtain a soil temperature in excess of about 212° F. without the use of superheated steam. The moisture content of the soil increases during sterilization, but the increase is not materially affected by variations in steam pressure. Increasing the initial steam pressure does not decrease the quantity of steam required to sterilize the soil. The pressure of the steam under the pans remains constant at the various boiler horsepower due to heaving of the pan and increased escape of steam into the air as the boiler horsepower is increased. The pressure in the tile increases as the boiler horsepower is increased.

With the tile method, roughly 1 sq. yd. of soil may be sterilized per boiler horsepower. With the pan method 3 sq. ft. per boiler horsepower may be sterilized. About 2 lb. of coal are required per square foot of soil surface with both the tile and pan methods. The capacity of a steam heating main is greatly increased when used to convey steam for sterilization because of the absence of appreciable back pressure.

Forcing gladiolus outdoors by heating the soil with electricity, J. R. TAVERNETTI and S. L. EMSWELLER (*California Sta. Bul. 584 (1934), pp. 14, figs. 8*).—The results of a series of experiments conducted during the winter and spring seasons of 1931, 1932, and 1933 are reported, the purpose of which was to determine the effect and costs of this method of forcing outdoors.

The first year plants were grown in an uncovered frame, the second in the open field, and the third in a covered frame. The corms used in all the experiments were between 1.5 and 2 in. in diameter. The soil was warmed by a special heating cable consisting of a resistance wire insulated with felted asbestos and enclosed in a lead sheath about 0.25 in. in diameter. This cable had a resistance of 0.5 ohm per foot and was connected to a 110-v circuit.

In the tests with the uncovered frames with two varieties of gladiolus the growth in the heated bed was always considerably more advanced than in the check bed. At first the foliage was a light green, but as the season advanced it became normal and the quality of flowers produced was in no way inferior. In the heated bed both varieties began to bloom about 2 weeks earlier than in the unheated and had finished before 25 percent of the latter had bloomed.

In the open field tests with six varieties, 8 beds, each 18 in. wide and 26 ft. long, were used, 4 being heated and 4 unheated. Three varieties were exposed to 60- and 102-day periods of heating. In each instance those varieties receiving the shorter period of heat began blooming before or as soon as those receiving the maximum amount. In all varieties the unheated corms began to bloom from 10 to 22 days later than the heated.

In 1933 the plantings of five varieties were made in four 6 by 30 ft. outdoor frames, 3 of which were heated and 1 unheated. During the first 9 weeks of the heating period all of the frames were covered at night and on cloudy days by sash made of wax-impregnated muslin.

The results obtained in the covered frames were in complete accord with those secured in the uncovered and open field beds. They also indicated that the beneficial effect of soil heating was in the early stages of growth and that continuous heating was not necessary. In each instance the heated plats began blooming first and at practically the same date. The time required, however, for 75 percent of the plants to bloom was considerably shorter on the plats heated 91 and 63 days than on the one heated for 35 days. All varieties except one showed a more favorable response to the 63-day period. In practically all varieties 75 percent of the heated corms had been cut before 25 percent of the unheated were harvested.

The results in general showed that the time required for gladiolus to bloom was shortened from 2 to 6 weeks by heating the soil with electricity to a temperature of between 60° and 70° F. Heating for about 60 days gave as good results as heating for about 100 days—in some cases better. Heating for 35 days was beneficial but did not give as good results as heating for 60 or 100 days. The quality and number of spikes produced were not affected by heating the soil.

The cost of heating the soil depends upon the temperature maintained and the method of planting. With electricity at 2 ct. per kilowatt-hour the cost of heating the soil in an uncovered frame was 2.4 ct. per square yard per day for maintaining a temperature about 16° above normal. In raised beds in the open field the cost of heating was 3.9 and 2.1 ct. per square yard per day for increasing the temperature 16° and 11°, respectively. In frames covered with wax-impregnated muslin the cost of heating was about 2.5 ct. per square yard per day for increasing the temperature 20°.

Trench silos, R. C. MILLER (*Ohio Sta. Bimo. Bul. 171* (1934), pp. 205–207).—Practical information is given on the construction of trench silos for Ohio conditions.

Electric brooding of chicks.—I, Heat requirements, W. T. ACKERMAN, T. B. CHARLES, G. M. FOULKROD, A. E. TEPPER, and F. D. REED (*New Hampshire Sta. Circ. 46* (1934), pp. 16, figs. 7).—Experiments are reported in which the brooding of chicks by electricity in colony brooder houses was successfully carried out through the winter and spring of 1933–34.

One of the coldest winters on record was experienced, the temperature going as low as 30° F. below zero, and for several days at a time the average for a 24-hour period was approximately zero. Notwithstanding this extreme temperature, the losses were reasonable.

The growth of chicks was very favorable, uniformity was in evidence, and feathering was somewhat more rapid than in similar lots under hot water brooding. Comparisons between chicks in insulated and noninsulated houses with reference to feed consumption, weight gains, condition of chicks, condition of litter, and kilowatt-hours of electricity consumed showed practically no differences. The use of insulation on walls and ceilings seemed unwarranted.

It was found that during extremely cold weather the litter just outside the edge of the hover became so damp, due to moisture condensation, that frequent removal was necessary. There was not sufficient heat loss from the electric brooder to evaporate moisture so deposited.

The 4 houses used in this study were of the individual colony type, 2 having shed roofs and 2 having combination gables.

Designing insulation into farm buildings, G. D. ANDREWS (*Agr. Engin., 15* (1934), No. 10, pp. 350–352, figs. 2).—Technical information is given for use in designing insulation.

Sanitation in relation to the production of farm commodities (*Agr. Engin., 15* (1934), No. 8, pp. 284, 285).—This is the report of the American

Society of Agricultural Engineers' subcommittee of the Joint Committee on Rural Sanitation sponsored by that society, the American Public Health Association, and the Conference of State Sanitary Engineers. It is a brief review of experiment station research bringing out the points of coordination between agricultural engineers and commodity specialists with reference to the important sanitary engineering aspects of production.

The action of water on lead with special reference to the supply of drinking water, H. INGLESON ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Water Pollut. Res., Tech. Paper 4* (1934), pp. VI+115).—This is a summary of existing knowledge on the subject. In addition to brief descriptions of the work of previous investigators, sections are included dealing with lead poisoning from drinking water in different parts of the world and the protective measures adopted.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Missouri Station, 1932-33] (*Missouri Sta. Bul.* 340 (1934), pp. 22-26, fig. 1).—Findings in investigations not previously noted are reported as to the economic use of power, labor, and machinery in crop production, by O. R. Johnson and B. H. Frame, in which data obtained in cooperation with the U. S. D. A. Bureaus of Animal Industry and Agricultural Engineering in 7 counties are given as to disking and plowing, corn planting, and husking corn; relation of farm improvements to earnings, by Johnson; cost of family living on the farm, by Frame, using data for 72 farms in Atchison County; the farm real estate situation in Missouri, by C. H. Hammar and R. K. Moore; a map showing the average county tax rates from 1926 to 1930, inclusive, and tax delinquency in 13 counties in Missouri, by Hammar; and the average expenditures, 1914-31, in 10 counties for agricultural extension, criminals, hospitals, paupers, insane, salaries and fees, miscellaneous, roads, and schools, by Hammar and G. T. Barton.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul.* 171 (1934), pp. 207-210).—Included are (1) some findings in a study of the agricultural activities of 202 rural nonfarm families in the vicinity of Columbus, made by F. L. Morison, as to cash incomes from agricultural activities, value of home-grown foodstuffs consumed and sold, size of tracts operated, etc.; (2) a table by J. I. Falconer showing the August 1934 price and the August parity price for various Ohio farm products; and (3) a table by Falconer bringing the index numbers of production, prices, and income down through August 1934 (*E. S. R.*, 72, p. 272).

[Investigations in agricultural economics at the Wisconsin Station, 1932-33] (*Wisconsin Sta. Bul.* 428 (1934), pp. 113-119).—Results of investigations not previously noted are reported as to a survey of Langdale County land resources made in cooperation with the extension service, the geological and natural history survey, the conservation department, and the department of agriculture and markets of the State and the Forest Service, U. S. D. A. Tables are included and discussed showing areas in agriculture and forests and assessed valuation, areas of each type in different soil and ownership classes, areas in different soil classes delinquent in taxes, and the taxes per acre of forest and agricultural lands and in different land classes and different soil classes in ownership.

In a discussion of milk distributors' margins compared with prices dairymen receive, the changes in the percentage of milk sold as surplus are discussed and a table is included showing the part of the retail price of milk going to dealers and farmers in the periods 1927-29 and 1931-33.

The increase in livestock trucking during recent years, the death losses in truck and railroad shipments, and the possibilities of truck shipments by livestock shipping associations are discussed.

The agricultural outlook for 1935 (*U. S. Dept. Agr., Misc. Pub. 215 (1934), pp. 132*).—"This report presents a summary of facts bearing upon the present situation and probable developments with respect to agricultural production and marketing in 1935. The best available information has been assembled and carefully studied before preparing statements designed to help farmers in making decisions for the next year's operations. These statements were prepared by the staff of Bureau of Agricultural Economics and have been considered in detail and revised in conference with agricultural economists from the agricultural colleges, experiment stations, and extension services of the States, as well as others representing other bureaus of the Department of Agriculture, the Agricultural Adjustment Administration, and the Farm Credit Administration. The conclusion, therefore, presents a composite result of the best judgment of the representatives of these several agencies.

"In the preparation of these reports the workers had available information contained in the several reports on the drought, prepared by the Bureau, the facts regarding the results of the various adjustment and marketing agreement programs, as well as a large amount of special data assembled for use in planning these activities. The facts concerning foreign competition and demand were also more comprehensive than have been available at any time in the past, as a result of the numerous special studies which are being made on general subjects relating to foreign-trade agreements."

It deals with domestic and foreign demand for agricultural products; agricultural credit; farm labor, equipment, and fertilizer; farm-family living; and the outlook for different crops, different kinds of livestock, and livestock and poultry products.

Achieving a balanced agriculture (*U. S. Dept. Agr., Agr. Adjust. Admin., Field Inform. Sect., 1934, pp. II+52, figs. 4*).—This pamphlet was prepared by the Agricultural Adjustment Administration. The first four chapters "show why surpluses of farm produce were ruining American agriculture at the time of the adoption of the Roosevelt Administration's agricultural adjustment program. The fifth chapter gives figures on the actual farm situation as it was when that program was first applied." The next three chapters explain the fundamentals of the Agricultural Adjustment Act. "They show what is meant by 'parity' prices. They describe how production is controlled through benefit payments, marketing agreements, and licenses. They discuss the processing taxes by which production control is being financed." The next chapter "gives a brief description of certain other policies of the Roosevelt Administration from which the American farmer has received assistance in addition to that provided by the Agricultural Adjustment Act, policies which have raised the general price level, and policies which have aimed to increase the purchasing power of groups that normally buy large quantities of farm products. The final chapter summarizes the improvements in the farm situation which took place, largely due to the influence of these policies, between 1932 and 1934."

Iowa State Planning Board Progress Report, 1934 ([*Ames*]: *Iowa State Planning Bd., 1934, pp. [6]+[VIII]+507, pls. 149, figs. 6*).—This is a preliminary report, in multigraphed form, of progress of the Iowa State Planning Board submitted to the National Resources Board. It is divided into four parts as follows: Land utilization in Iowa with sections and projects on a land use program, fish and game, part time farming in Iowa, industrial recreational project, historic and scenic, and surveys, maps, and plans; water resources of Iowa with sections and projects on well core analysis and water

analysis, precipitation, flood control, and stream flow, public water supply and waste disposal, meandered stream survey, other water resources, and lower Des Moines River project; social resources of Iowa with sections and projects on population and social trends, rural, secondary, and adult education, health and housing, zoning and city and regional planning, public relations, and legislation; and industrial resources of Iowa with sections and projects on transportation, industry and business, public service, and public works.

The objectives, the problems, and the method of procedure for each project are described and discussed, and the available data and results of the investigations are summarized in text, tables, charts, maps, etc.

Land utilization in Minnesota: A State program for the cut-over lands (*Minneapolis: Univ. Minn. Press, 1934, pp. XIV+289, pl. 1, figs. 47*).—This is the final report of the committee appointed in 1932 by the Governor of Minnesota to study the effects on the economic and social life of the communities and on the welfare of the State of the reversion to the State of large areas of tax-delinquent cut-over land in the northern counties. The physical and climatic features affecting land use, land policies in Minnesota, social and economic effects of past land development, population trends and land use, present and possible future need for agricultural land, forest lands—their present condition and future development, the use of land for recreation, water and mineral resources as related to land use, taxation as it affects land use, local government under changed land use conditions, the financial relations of State and local governments, and future use of land in Minnesota are discussed. The findings are summarized and recommendations made.

Appendixes include the letter of the Governor appointing the committee, his outline of the field to be covered, a progress and an interim report of the committee, the Wisconsin zoning law, and a typical Wisconsin county zoning ordinance. An annotated bibliography of the sources of information concerning problems of land utilization in Minnesota is also included.

History of farm land prices in eleven Nebraska counties, 1873–1933, E. H. HINMAN (*Nebraska Sta. Res. Bul. 72 (1934), pp. 60, figs. 17*).—This bulletin is based on records of 76,544 true sales of farm land by warranty deed during the period 1873–1933 and 14,418 other transfers during the period 1920–33 in 7 counties (Clay, Fillmore, Otoe, Polk, Seward, Saline, and York) in southeastern Nebraska where 50 percent or more of the acreage was in farms and 40 percent or more of the income in 1929 was derived from cash sale of grain or other crop specialties; in 2 counties (Merrick and Platte) in the east central part of the State in which 50 percent or more of the farm acreage was in livestock farms; in 1 county (Logan) in the sand-hill grazing area in the western part of the State; and in 1 county (Box Butte) in the Nebraska panhandle where ranching predominates. The data for the years 1910–33 for all counties were obtained from county deed registers. For the period 1873–1909 the data for Box Butte, Logan, and York Counties were also obtained from the same source, while those for the other counties were obtained chiefly from reports of land transactions published in the local newspapers.

Tables and charts are included and discussed showing for each section, by years 1873–1933, the number of sales by warranty deed, number of acres sold, total consideration and relative consideration (1910–14=100), and the sales price per acre; the distribution of the sales, 1910–33, by price groups and by size of tracts; for 1874–1933 the sales per 100 farms, such sales compared with value per acre and acres sold per 100 acres in farms; the velocity of sales in York and Box Butte Counties, 1917–20; and transfers, 1920–33, in each section by true sales, foreclosures, token, quitclaim deeds, etc., and to credit corporations. The effects of farm income, commodity prices, mortgage interest rates,

transportation costs, soil types, and other factors on land prices are discussed briefly.

The average price per acre in the 7 southeastern counties rose from \$6 in 1876 to \$180 in 1920 and then declined to \$77 during the first 8 months of 1933. In the 2 east central livestock counties the average prices were \$5, \$165, and \$74, respectively. In Logan County the prices increased from \$2 in 1884 to \$29 in 1921 and then declined to \$6 in 1933. In Box Butte County the increase was from less than \$2 to \$43 in 1921, followed by a decline to \$16. The percentages of true sales of all transfers decreased from 81 in both the eastern and western areas in 1920 to 30 in the 9 eastern counties and 21 in the 2 western counties in 1933. The percentages of foreclosures increased from 0.3 to 14 in the eastern counties and from 0.5 to 26 in the western counties.

Land price, 1914-33, followed the trend of Nebraska farm income, but the changes were much less extreme, and there was a lag of 1 or 2 yr. From 1873 to 1894 the general commodity and the farm land price indexes moved in opposite directions, that for land rising; from 1899 to 1910 both increased, but the increase for the land prices was the greater; and from 1914 to 1933 the two indexes corresponded quite closely.

Mortgage interest rates in 11 townships studied in southeastern Nebraska declined from 11 percent in 1874 to about 5.5 percent in 1905 and then remained practically stationary, except during the period 1917-22. Land turn-over during the period of peak prices was more rapid for rough, rolling, sandy, and clayey land than for better land. Foreclosures and other forced sales were most numerous for the types of soil which sold most rapidly during the peak price period.

Farm building studies in northwest Missouri, J. C. WOOLEY (*Missouri Sta. Res. Bul. 218 (1934), pp. 43, figs. 31*).—A survey was made of 100 farms on Marshall silt loam in Nodaway County, representative of the more valuable lands of the State in 1929, and of 110 farms in the Grundy area in Linn County, representative of medium lands in 1930.

Tables, charts, equations, and correlations show the relations of replacement costs of living and service buildings to such factors as present worth, size of farm, distance to market, crop index, real estate value, number of crop acres, number of animal units, labor income, and returns per \$1 worth of feed fed; of percentage of real estate in buildings to size of farm; operating costs to value of feed fed; value of poultry buildings to returns per \$1 worth of feed fed; annual cost of buildings to feed fed per \$100 of such costs; etc.

Spouting increased the life of buildings 41 percent, foundations 8 in. high or higher 43 percent, and painting only when built 21 percent and as needed 43.5 percent. First painting (3 coats) on barns yielded 3.73 percent, and painting as needed 3.22 percent interest compounded annually on the investment. Crop acres accounted for 4.1 percent of the variations in replacement costs of service buildings, crop index accounted for 26.2 percent, and number of animal units for 29.3 percent. Distance from market had little, if any, effect on investment in buildings. Investment in buildings yielded 88 ct. on the dollar invested.

On a majority of the farms the service buildings were less than 85 percent adequate for the livestock owned. Such buildings made up 5.7 percent of the cost of producing livestock and livestock products. Efficiency in lay-out of buildings and fields did not seem to influence efficiency in the use of labor. The average investment per animal in buildings for different kinds of livestock were for work stock \$95, dairy cows \$108.13, stock cattle \$39.90, brood sows \$24.47, stock hogs \$7.25, hens \$1.68, and sheep \$10.87. The annual costs were

per horse \$7.16, cow \$8.14, brood sow \$1.84, and per hen 13 ct. Adequate service buildings required an average investment of \$18.27 per acre.

State measures for the relief of agricultural indebtedness in the United States, 1933 and 1934, compiled by M. T. OLCOTT and L. O. BERCAW (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 53 (1934), pp. IV+402*).—This compilation, which includes the text of the statutes passed at the regular and special sessions of the State legislatures in 1933 and 1934 and the court decisions on the constitutionality of the measures, supplements that previously noted (*E. S. R.*, 69, p. 604). Legislation providing additional credit for farmers is not included.

Fifteenth Census of the United States, 1930: Taxes on farm property in the United States, W. B. JENKINS (*Washington: U. S. Bur. of the Census, 1933, pp. IV+120, figs. 24*).—Most of the data included were obtained in the general agricultural census of 1930, and the figures in general are those for the calendar year 1929. Some of the data are for the United States as a whole, some for States with district subtotals, but the bulk is for 100 selected counties grouped into somewhat definite areas in 11 States selected to represent different types of farming areas, good farming and poor farming areas, and areas with a minimum urban influence on farm values and taxes. Chapters present and discuss tables and maps showing (1) the amount of Federal, State, and local revenues, the functional distribution of State and local expenditures, the relation of taxes to income, and the assessment of farm property; (2) the census as a source of farm tax information; (3) the average taxes on farm real estate per acre and per \$100 of full valuation in different States, and the ratio of farm real estate taxes to all farm property taxes; and (4) the assessment of farm real estate according to value of farm, size of farm, average value per acre and average value of farm and per acre when the other factor is held constant, and the relation of taxes and gross income from cash-rented farms.

Economic readjustments in the dairy industry in Delaware, R. O. BAUSMAN (*Delaware Sta. Bul. 190 (1934), pp. 111, figs. 41*).—This study is based chiefly on from 193 to 226 farm records for the years 1928, 1929, and 1930 obtained from farmers in the Middletown, Kenton, and East Dover areas, data from milk distributors, and previous studies made by the station in the Middletown area covering the years 1914 and 1924. Tables and charts compare the data obtained, for the most part with an accompanying discussion. Comparison is made of the organization on the better and the poorer paying farms.

The average amount of milk or milk equivalent sold per farm per year in the Middletown area was 38,918 lb. in 1914 and 67,185 lb. in 1928–30. Only about 25 percent of the farms studied in 1914 marketed their dairy products as fluid milk. In 1928–30 every farm marketed fluid milk, and dairying was a major source of income on all farms. In general, increasing the acreage of field corn, sweet corn, wheat, intensive cash crops, mixed hay, and pasture did not increase labor income significantly. Farms where labor, management, and capital were concentrated on the dairy enterprise returned appreciably better net incomes than those with smaller and lower grade herds.

Season of freshening, amount of mixed hay fed, acreage of wheat pasture and rotation pasture, and feeding of silage had no significant influence on milk production per cow. Feeding legume hay and the quality of the cows as measured by value had an appreciable influence. Cows freshening in the fall produced more milk than those freshening in the spring, due to receiving more grain. Many dairymen are feeding too much or too little grain. A close relation existed between seasonal variation in milk sold and net incomes.

The optimum incomes were earned where approximately the basic amount of milk was sold in the first quarter of the year, not to exceed 120 percent of the basic amount in the second quarter, and not less than 80 percent of the basic amount in the third quarter.

About one-half of the dairymen had adjusted themselves to the basic-surplus plan, about one-third were producing excessive surplus milk, and about one-sixth were over-adjusted. The basic-surplus plan increased the management risk. Normally, the average monthly surplus was about 12 percent.

The New Zealand dairy industry, G. A. DUNCAN (*Palmerston North, N. Z.: H. L. Young, 1933, pp. XIV+395*).—This is a textbook on the formation, administration, accounts, finance, costing, and statistics of dairy factory companies. Specimen forms and rulings of books and records are given. Included also is a review of the New Zealand dairy industry outlining the industry and discussing its present organization, the constitution of cooperative dairy companies, the Dairy Industry Act, 1908, and amendments and general regulations, and the Dairy Produce Export Control Act, 1923, and amendments.

British sugar beet: Ten years' progress under the subsidy, A. BRIDGES and R. N. DIXEY (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1934, pp. 92*).—This is a report of 10 years' progress under the British Sugar (Subsidy) Act, 1925. The development of the industry; its effect on other crops, the livestock industry, farm capitalization, and agricultural employment; and the future of the industry are discussed. Analysis is made for the period 1924–32 of the costs for labor, manure, fertilizers, lime, rents and rates, transportation, yields, returns, etc.

Cotton production in Egypt, P. K. NORRIS (*U. S. Dept. Agr., Tech. Bul. 451 (1934), pp. 43, figs. 12*).—The climate, soils, irrigation, population, land tenure, and crop rotation of Egypt are described, and the cost items in the production of cotton, acreage and production, cotton-producing districts and yields in each, the factors influencing acreage yields, the effects of governmental action on cotton production of the country, and the factors influencing future production are discussed.

Production increased up to 1914, in which year 1,334,000 bales were harvested from 1,822,000 acres. During the last 5 yr. the acreage has fluctuated between 2,162,000 and 1,135,000 acres. A substantial permanent expansion of the cotton acreage would require the reclamation of waste land and the extension of the irrigation and drainage systems of the country. The shift in Egypt from long-staple cotton to higher-yielding but shorter-staple varieties is of greater importance to American growers than is the expansion of acreage. "It is possible that in the future as much as 80 percent of the Egyptian crop will range between 1½- and 1¾-in. staple. With an average crop, this would mean from 1,000,000 to 1,500,000 bales of a staple length comparable with the best American staples."

Fifteenth Census of the United States, [1930]: The farm horse, Z. R. PETTET (*Washington: U. S. Bur. of the Census, 1933, pp. IV+84, figs. 10*).—"This is a study of the farm-horse situation in the United States and closely related problems, particularly the causes and effects of the decrease in the number of work animals in recent years, brought out in the analysis of census statistics."

The horse situation is reviewed and discussed, with tables showing births and mortality, ages, types and breeds, exports and imports, the world situation, and the value of horses and mules and the effect of age on such value. Other chapters present tables and discuss the horse and mule in relation to type of farm, the replacement of horses and mules by automobiles, tractors, trucks, and other machinery; the effects of machinery on acreage and produc-

tion of crops and livestock; the effects of the decrease of horses and mules on specific crops, classes of livestock, and plowable pasture; surpluses in different crops and swine products; and the effects of surpluses and low prices on farm purchasing power. The final chapter is a résumé of the trend in the number and value of horses and mules and the outlook for the future, and includes a summary of the conclusions reached by the author.

Factors affecting the market qualities of New Mexico eggs, A. L. WALKER, L. N. BERRY, and P. W. COCKERILL (*New Mexico Sta. Bul. 224 (1934), pp. 23, figs. 7*).—This is a study of the effects of age of eggs, the temperature at which held, way handled before delivery to the market, and the rations fed upon the quality of eggs. Through cooperation during a 4-yr. period with 36 producers in the eastern dry-farm area of New Mexico, data were obtained regarding the methods of care and management of flocks, age of eggs, the temperature at which held, whether eggs were fertile or infertile, whether hens had access to cottonseed meal, whether green feed was fed, method of transportation, and method of packing. The eggs were candled and graded at El Paso, Tex., by college workers.

The index of the quality of eggs where the hens obtained cottonseed meal (only from picking about cattle feed troughs, no regular ration) decreased from about 85 for eggs kept at 44° F. to about 74.5 for those held at 92°. Where no cottonseed meal was obtained the decrease was from about 89 to about 81. The average index of quality of infertile eggs where no green feed or cottonseed products had been fed and hauled with "rough treatment" was 85.1, as compared with 87.3 for those receiving "good treatment." A test with 18 cases obtained from the same producer showed No. 1 eggs lost 12.6 percent and No. 2 eggs 8.2 percent when shipped by express and 24.1 and 16.3 percent, respectively, when shipped by parcel post.

Eggs produced under almost ideal conditions (infertile, no cottonseed products or excess of green feed, and good treatment in hauling) had an index of quality after 1 or 2 days of approximately 93 when held at 44° and 88 when held at 92°. After 10 days the indexes were approximately 88.5 at 44° and 70 at 92°. At an average temperature of 68° the loss in quality averaged 1.2 percent for each additional day up to 12 days. The index of quality of fertile eggs averaged about 5.4 percent lower than that for infertile eggs, and decreases with temperature increases were more rapid.

Eggs packed with the small end down had an index of 3.5 percent higher after shipment than did those packed with the small end up. The quality of No. 1 eggs shipped by truck decreased 20 percent in shipment, those shipped by refrigerator freight 14.2 percent, and those by express 11.1 percent.

The sale of cotton in the seed in Oklahoma, L. S. ELLIS, A. M. DICKSON, and C. C. McWHORTER (*Oklahoma Sta. Bul. 219 (1934), pp. 64, figs. 7*).—This study, carried on in cooperation with the Bureau of Agricultural Economics, U. S. D. A., was made "(1) to determine the extent and distribution of the practice of selling cotton in the seed in Oklahoma and to determine whether or not the practice is increasing or decreasing; (2) to measure the differences between the prices received by farmers in their local markets for cotton sold in the seed and in the lint bale; (3) to measure the differences between the prices received by farmers for both seed and lint cotton in their local markets and the prices paid for the same grades and staples of cotton in the central market; (4) to analyze the variation in grade, staple length, and turn-out of individual loads of seed cotton sold at the same price; (5) to call attention to some of the factors responsible for, or associated with, the development of the practice; and (6) to point out the economic effects on farmers, middlemen, and spinners of the practice of selling cotton in the seed."

The State was divided into four areas on the basis of the average percentage of all cotton sold in the seed in the period from 1923-24 to 1931-32. The trend of sales in the seed, quality and variety of cotton in the different areas, and the size of the loads of cotton sold in the seed are discussed with tables and charts. Analyses and comparisons are made of the prices paid for cotton of different grades and staple lengths sold in the seed and in the lint in the local markets, 1930-31 and 1931-32, and of such prices and the values on a basis of Houston, Tex., quotations. The relationship of profits in the ginning business to prices paid for cotton, the variations in the quality and turn-out of specific loads of seed cotton in the same markets, and the advantages and disadvantages to growers, ginner, and spinners of buying in the seed are discussed.

The percentages of cotton sold in the seed in different counties during the 9-yr. period varied from 75 to 100 in the northeastern area, from 50 to 75 in the southeastern area, from 25 to 50 in the east central area, and 25 or less in the southwestern area. The practice of selling in the seed is increasing more in the areas of heavier production. The areas of high percentage of sales in the seed produced a high quality of cotton as to variety, grade, and staple length. Farmers in the areas of high sales in the seed hauled a relatively large number of loads of seed cotton of sufficient size to gin bales of cotton.

As a rule a higher price (0.54 ct. per pound in 1930-31 and 0.25 ct. per pound in 1931-32) was paid for cotton in the seed than for cotton in the lint. In 1930-31 the spreads between the Houston prices and local prices were only 0.25 ct. per pound for cotton in the seed and 0.79 ct. for cotton in the lint. In 1931-32 the Houston margin lacked 0.78 and 0.24 ct., respectively, of meeting the handling charges. In all local markets, and especially in the case of cotton in the seed, relatively more was being paid for the lower qualities of cotton. Regardless of a great deal of variation in grade, staple length, and percentage turn-out, usually all seed cotton in the same market was bought at the same price on a particular day. Selling in the seed acts as a price incentive for the production of low turn-out cottons which generally produce the better qualities.

The mixed carload in distribution of vegetables from the Lower Rio Grande Valley of Texas. W. E. PAULSON (*Texas Sta. Bul.* 497 (1934), pp. 40, figs. 8).—A study was made of the straight carload and mixed carload shipments during the period 1910-11 to 1930-31, special attention being given to the period 1926-27 to 1930-31. Tables and charts show, by years, the straight carloads and the straight carload equivalents in mixed carload shipments of different vegetables for the 21-yr. period and for the 5-yr. period the weekly distribution of such shipments, the relative importance of different vegetables in mixed shipments, the destination of mixed shipments to cities of different sizes, the percentage mixed shipments were of total shipments to cities of different sizes, etc. The effects of truck shipments and freight rates on mixed carload shipments, the vegetables shipped in mixed cars to small and large cities, and the advantages of such shipments for both types of cities are also discussed.

Mixed carloads constituted 8.9 percent of total shipments in the period 1910-11 to 1915-16, 33 percent in the period 1921-22 to 1925-26, and 31.9 percent in the period 1926-27 to 1930-31. The decrease in the last 5 yr. was due to the increased movement by truck and a marked increase in the shipment of corn and tomatoes, which moved chiefly in straight carlots. During the period 1926-27 to 1930-31 the average percentages of total freight shipments by rail moving in mixed cars were for cabbage 24.6, carrots 51.8, beets 49.4, potatoes 23.6, beans 44.8, spinach 38, onions 28.8, tomatoes 6.9, and corn 6.7. The total percentages for the 9 vegetables shipped in mixed cars were from

50.5 to 56.2 in cities under 30,000 population, from 43.1 to 53 in cities of from 30,000 to 100,000 population, and then decreased with size of cities to 21 in cities over 1,000,000 population.

Some of the advantages of mixed shipments are: Lengthens the shipping season, permits greater diversification of plantings, makes possible expansion of direct shipments of staple vegetables to small cities and of specialty vegetables to large cities, and facilitates grower-dealer shipments. Other advantages for large cities are: Facilitates the introduction of new vegetables, greater freshness, convenience in sales by receivers to jobbers, and facilitates proper adjustment of movement to smaller markets. The chief disadvantages of such shipments are: Loading costs from \$15 to \$25 more per car, maintenance of the quality of the various vegetables is difficult due to different conditions required in shipping, order in loading of vegetables often is not convenient to purchaser, shipments are not readily diverted en route, prorating of shipments is more complicated, and freight rates are higher.

Membership problems and relationships in Iowa farmers' elevators, F. ROBOTKA (*Iowa Sta. Bul. 321 (1934), pp. 105-195, figs. 7*).—The data analyzed were obtained from answers to a questionnaire secured by personal interviews with managers and other officials and from records of the Secretary of State of Iowa and the Farmers' Grain Dealers Association of Iowa. Special attention is given to the development, trends, and tendencies in cooperative elevators since 1920-21. Statistics are presented and discussed covering the changes in total, producer, nonproducer, and nonresident membership, and the membership density and volume of grain and side-line businesses. The consequences of failure to maintain producer membership, the factors contributing to the present membership situation, and the actual cooperative character of the elevators and the factors affecting such character are discussed.

In the over 300 elevators studied the membership ranged from 23 to 681, 75 percent having only from 50 to 200 members. Twenty-three percent of the members neither owned nor operated local land, and less than 50 percent owned the farms they operated. The membership in over one-third of the elevators was less than 100 and in nearly 20 percent less than 50. In over one-third of the membership of the elevators the active membership represented less than 60 percent of the total membership. The volume of side-line sales per square mile of trade territory increased from \$533 to \$995 and the percentage of corn and oats shipments from 62 to 81 as the number of producer members per square mile increased from less than 1 to 3 or 3.5 and over. Of the companies with 20 percent or less of nonproducer members, 24 percent reported such membership a problem. Of the companies with 21 to 40 percent of nonproducers, 47 to 48 percent reported such a problem, while of those with 51 to 60 percent, 79 percent so reported.

Some of the suggestions for improving the membership situation are as follows: Greater ease in acquiring and terminating membership, prorating of savings as patronage dividends rather than paying a higher price for grain, application of patronage dividends on purchases of shares, provision for transfer of shares from nonproducers to producers, limitation of the membership to farmers, and making the company the sales agent of members rather than merely another buyer in the territory.

A study of the Wilmington curb market, H. S. GABRIEL (*Delaware Sta. Bul. 191 (1934), pp. 50*).—This study is based on the following data: (1) Records of commodities sold, methods of selling, methods of determining price, etc., of 79 vendors on the Wilmington curb market; (2) similar data gathered by questionnaires from 23 representative farmers in the Lancaster market house area; (3) a survey of 12 farmers who have stood on the Lancaster

curb market and market house; and (4) 268 questionnaires returned by Wilmington homemakers patronizing the curb market. The data for the 79 vendors are analyzed to show the products sold, distance to the market, time spent on the market, value of loads, sales to regular customers, methods of fixing prices, methods of preparing products, etc. The homemaker data are analyzed to show the use made of the market, reasons for patronizing or not patronizing the curb market, and suggestions for improvement of marketing conditions.

The average receipts per vendor were \$16.70 per day in the winter and \$18.90 in the summer. An average of 7.2 hr. each on Wednesday and Saturday was spent on the market. Of the people buying on the curb market, 85 percent purchased vegetables, 56 percent fruit, 54 percent eggs, 46 percent chickens, and 42 percent flowers. Freshness was the reason most frequently given for patronizing the curb market. Meats, butter, and cooked foods were not popular.

Annual report of the Chief of the Grain Futures Administration, 1934, J. W. T. DUVEL (*U. S. Dept. Agr., Grain Futures Admin. Rpt., 1934, pp. 9*).—Included are tables showing the volume of trading in different grain futures, the volume of future contracts settled by delivery, and the open commitments in each wheat and corn future semimonthly, June 30, 1933, to June 30, 1934. The investigation of the price collapse on July 19 and 20, 1933, legislation recommended, the litigation, the modification of reporting requirement, and privilege trading are discussed.

Packers and Stockyards Division (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1934, pp. 29-35*).—This covers the formal court proceedings under the Packers and Stockyards Act, stockyards under the jurisdiction of the act, registrations of dealers, rates and charges, bonds, trade practices, scales and weighing, audits and accounts, the control of interstate transportation of livestock, and the enforcement of the transportation and quarantine laws. Six tables summarize the information compiled from the annual reports received from packers, stockyard companies, marketing agencies, and dealers.

Crops and Markets, [October–November 1934] (*U. S. Dept. Agr., Crops and Markets, 11 (1934), Nos. 10, pp. 377-416, figs. 3; 11, pp. 417-456, figs. 3*).—Included are tables, charts, reports, summaries, etc., of the usual types covering crop and livestock estimates, market reports, and the price situation. No. 11 also contains a brief discussion of the agricultural outlook for 1935 (see p. 548).

RURAL SOCIOLOGY

Farm organization and family incomes in Knott County, Kentucky. W. D. NICHOLLS and W. L. ROUSE (*Kentucky Sta. Bul. 351 (1934), pp. 141-184*).—This study, made to obtain data to serve as the basis for a long-time program for bettering the economic and social conditions in the area, is part of a comprehensive investigation being carried on in cooperation with the U. S. D. A. Bureaus of Agricultural Economics and Home Economics and the Forest Service. It is based on income and farm business records obtained from 228 farms for the year ended April 1, 1930, and 25 farms for the year ended April 1, 1932, in 4 of the 7 magisterial districts of the county. Analysis is made, by districts and for the area as a whole, of the sources of income, amount of income, value of family living obtained from the farm, tenure of operators, land utilization, crops and livestock raised and value thereof, capital investment, farm receipts and expenses, labor income and operators' earnings from farming, the factors affecting net income, relation of nonfarming income to net income, etc.

Of the 228 farm families, only 15 percent made their living mainly from farming. Receipts from crops and livestock enterprises averaged only \$165 per family (\$42 less than sufficient to meet farm operating expenses), as compared with \$333 from outside sources. The value of farm products used for subsistence averaged \$481 per family. The spendable income from all sources averaged \$518 per family the first year, being \$200 or less for 20 percent of the families. The second year the average was \$286, being less than \$100 for 25 percent of the families. The average size of the farms was 113 acres, of which only an average of 13 acres was cropped.

The 10 most successful operators had net earnings of more than \$1,400, but of these 9 derived the greater part of their income from outside sources. For the 228 farms, the 22 full-time farms, and the 10 most and the 10 least successful full-time farms the average net earnings were \$632, \$626, \$870, and \$393, respectively. The only profitable full-time commercial farming in the area consists of the production of specialties, such as vegetables, poultry, eggs, etc., but opportunity for such farming is limited.

What chance has the city man on a Wisconsin farm? (*Wisconsin Sta. Bul.* 428 (1934), pp. 119-124).—An evaluation of the opportunity for a city family to make a living by moving into the country and engaging in farming, derived from data gathered in 1932 in 24 townships in Adams, Rusk, Sawyer, and Douglas Counties.

Interstate migrations among the native white population as indicated by differences between State of birth and State of residence, C. J. GALPIN and T. B. MANNY (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. 105, figs. 98*).—These data, based on the census 1870-1930, are presented in tabular form but mainly as a series of maps for each State and the District of Columbia.

Status of farm housing in Iowa, M. G. REID (*Iowa Sta. Res. Bul.* 174 (1934), pp. 285-396, figs. 32).—This report is based upon a study of 8,298 owner and 10,491 nonowner houses in 154 townships in 10 representative Iowa counties. Frame houses of about 7 rooms and more than 1 story predominate. Only about 2 percent are of brick, stone, or concrete, and about 10 percent have 1 story. Nearly 3 out of every 4 were built 25 or more years ago. The average 1930 census value of the houses surveyed was \$2,375. The houses are in need of repair, and paint is most neglected. About 1 in every 8 houses needs to be replaced. The families vary in size from 1 to 16 persons, with 4 as the most frequent number. The larger families live in the most crowded quarters, there being only a slight tendency for the larger families to live in the larger houses.

About 1 house in 5 has a bathroom. Only 2 families out of 3 have a cistern. About 75 percent of the families carry water a distance of 94 feet, while 25 percent have piped cold water and 12.5 percent have piped hot water in the house. Slightly more than half of the houses have a kitchen sink with drain and about one-fourth of them have improved toilet facilities. Less than 1 family in 5 has a bathtub, and 1 family in every 3 has a cesspool, septic tank, or drainage into a stream. Only 1 family in 4 has electric lights, and stoves are used for heating 62 percent of the homes.

Few families have ice or mechanical refrigeration and about 95 percent have coal or wood cook stoves. The majority of homes have some kind of lawn established; 3 in every 4 have some planting; and less than 2 in every 3 have a fence about the house, and many of the latter are in need of repair or replacement.

During the past 3 yr. the majority of families have spent less than \$100 on repairs and improvements. Owners have smaller families and larger houses than nonowners. In 1930 the average value of white owner dwellings

was \$2,624, while those of white nonowners was \$1,930. The nonowner houses were not in as good state of repair as the owner houses, and the household equipment, such as hot and cold water, electric lights, and labor-saving conveniences, such as power washing machines, is not as good in the nonowner as in the owner homes.

Differences between owner and nonowner houses vary decidedly from county to county. For example, the average value of houses in Scott County was \$3,266, while in Davis County it was \$1,676. In the past 10 yr. none out of 57 houses studied was built of stucco, while a marked increase occurred in the proportion of brick and 1-story houses. In the older houses the foundations were especially poor. The newer the houses the fewer are the rooms, while a marked increase has occurred in the proportion of houses having bathrooms. Septic tanks, hot and cold piped water, and piped warm air, water, or steam are becoming increasingly numerous. On the large farms the houses are larger and better equipped but in poorer condition than those on farms of medium size. Houses of owners, nonowners, and hired men on the small farms are much below the standards of those of the medium and large farms.

Dutch owner families have a higher proportion of houses under 25 yr. of age, in good condition, with kitchen sink, electricity, and power washing machines; on the other hand, non-Dutch owner families occupied houses having a higher proportion of occupants per bedroom and a lower proportion of dining rooms, bathrooms, basements, piped hot and cold water, and septic tanks, while nonowner non-Dutch families are somewhat better housed than the nonowner Dutch families.

The status of nonowner houses is affected by the status of the landlords. For example, 44 percent of the owners have piped cold water, while 55 percent of the nonowners having the same surname as the landlord have these conveniences. Income and proportion of tenancy are two of the principal factors influencing housing and housing facilities.

The townships lying near cities report a higher average value of dwellings than those farther away. As the value of the dwelling increases there is a marked increase in the proportion of labor-saving devices and conveniences.

County government in Colorado. H. C. PEPPER (*Colorado Sta. Bul.* 413 (1934), pp. 183, figs. 4).—"The principal object of this study has been to analyze and explain the laws relating to county government in Colorado, the functions conferred upon county officers, and the administration of county government. Methods of conducting county business have been studied and suggestions for improvement offered. In doing this the best practices of the counties studied have been taken into consideration as well as those of other States." Sixteen Colorado counties were studied. The data are presented in sections on history and characteristics of Colorado counties, legal status of the county in Colorado, organization of county administration, classification of counties for fees and salaries, the board of county commissioners, the county clerk, county revenue and taxation, county finance, the sheriff and the coroner, the administration of justice, county highway administration, administration of elections, and public welfare. The findings are summarized, conclusions drawn, and recommendations made.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Aspects of land grant college education. P. O. JOHNSON (*Minneapolis: Univ. Minn. Press*, 1934, pp. XI+271, figs. 8).—The studies included are based largely on A Survey of Land-Grant Colleges and Universities published by

the U. S. Department of the Interior (E. S. R., 64, pp. 301, 389). Part 1, fiscal aspects, describes the support of public education in Iowa, Wisconsin, Minnesota, Ohio, Illinois, Indiana, and California; the fiscal trends at the University of Minnesota, 1910-28; and compares the policies at the Universities of Minnesota, California, Illinois, Ohio, and Wisconsin, 1925-29. Part 2, facilities of land-grant institutions, deals with the library facilities at different land-grant institutions and the faculty personnel at the University of Minnesota. Part 3, enrollment trends in higher education, discusses the enrollment of students, resident and nonresident of the State, at land-grant institutions; the selection of a college; and the trends in enrollment in agriculture, 1902-30. Part 4 deals with social and economic characteristics and the factors associated with college aptitude and achievement. Part 5, the human product, includes chapters on some aspects of the socio-economic and educational history and occupational history of graduates, and the financial status of graduates and nongraduates of the University of Minnesota, and farming as a profession.

Agricultural training in Canada, D. KALTENBACH ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Sci. and Pract.* [Roma], 25 (1934), No. 8, pp. 358-364).—The training in agriculture provided in each of the Provinces is briefly described.

Suggestions for teaching dairy cattle selection, A. F. KUHLMAN and W. B. NEVENS (*Illinois Sta. Circ.* 422 (1934), *Sup.*, pp. 8, figs. 4).—This material has been prepared for club leaders and teachers to be used in 4-H Club work with Circular 422, Selecting Dairy Cattle (E. S. R., 71, p. 830).

FOODS—HUMAN NUTRITION

Food and health, H. C. SHERMAN (*New York: Macmillan Co.*, 1934, pp. X+296).—Throughout the volume, which has been written to serve the intelligent layman, practical suggestions with convincing arguments are given for the type of food selection which makes for optimal v. adequate nutrition. The author emphasizes the need for intelligent thought on the selection of foods, since to secure optimal nutrition is "an opportunity which, while open to all, is realizable in full measure by each only insofar as he elects the option which it offers." Inducements for taking advantage of this opportunity are that "the option which our present knowledge offers carries the potentiality for the individual of a more buoyant youth of efficient development, a higher level of adult vitality and accomplishment, and an extension of the prime of life farther into the advancing years. It promises for a much larger proportion of us that full measure of well-being and happiness, of efficient service and satisfaction in life, which only the most fortunate yet enjoy."

Several tables of food values and records of three series of actual meals, each of which is in accordance with the principles of an optimal diet, are given as appendixes. There is also a selected bibliography compiled with the idea of extending the subject of the book to different though related fields and to views not necessarily identical with those of the author.

Studies in nutrition [at the Wisconsin Station] (*Wisconsin Sta. Bul.* 428 (1934), pp. 19-24, 25-31, figs. 3).—Included in this progress report (E. S. R., 69, p. 890) are summaries of studies by F. L. Kozella, E. B. Hart, and G. Bohstedt on the maintenance of normal calcium and phosphorus metabolism in puppies deprived of the parathyroid gland but treated with sufficient vitamin D to maintain a normal level of calcium in the blood (pp. 19, 20); by C. A. Elvehjem, Hart, and W. C. Sherman on the hemoglobin-building properties for rats, rendered anemic on milk, of various breakfast cereals alone and supplemented with iron and copper (pp. 20-22); by Elvehjem and M. Schultze on the mechanism by which iron and copper promote hemoglobin formation and by

Elvehjem and F. J. Stare on respiratory studies in anemic tissues (E. S. R., 71, p. 882) (pp. 22, 23); by Stare and Elvehjem on the distribution of cobalt in animal tissues (p. 23); by R. W. Todd, Elvehjem, and Hart on the role of zinc in the nutrition of rats (pp. 23, 24); by R. W. Haman and H. Steenbock on the energy of activating rays in terms of vitamin D equivalents (pp. 25, 26); by Steenbock and A. R. Kemmerer on the vitamin B content of muscle and liver tissues of rats, chickens, and pigs on normal rations and on rations low in vitamin B and high or low in fats (pp. 26, 27); by Steenbock, H. Feldman, and E. C. Van Donk on the anemia of pregnancy in rats (p. 27); by Steenbock, H. T. Scott, and M. H. Irwin on the destruction of vitamin D in boiling fat (p. 28); by K. P. Link and associates on the isolation of vitamin C in a crystalline state, its comparison with the known uronic acids, and the synthesis of various uronic acids (p. 28); by R. Nagy and W. E. Tottingham on the cause of, and M. Gleason and A. L. Marlatt on methods of preventing, the blackening of potatoes during cooking (p. 29); by H. T. Parsons, E. Kelly, and J. G. Lease on the protective factor against egg white injury (E. S. R., 71, p. 141) (p. 30); by D. R. Mendenhall and Elvehjem on a continuation of their studies (E. S. R., 70, p. 561) on response of anemic children to iron and copper treatment (pp. 30, 31); and by D. Husseman on the content of vitamins A, B, C, and G in uncooked broccoli buds and stems (p. 31).

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1934, pp. 5-10*).—Included in this annual report (E. S. R., 70, p. 557) are summaries of studies dealing with the relation of the vitamin A content of the ration of the hen to that of the eggs produced, the vitamin D content of four kinds of liver, the storage of selenium in the body, utilization of the calcium in sesame seeds, meat roasting and canning, foam volume and stability of thin and thick egg white, frying quality of various cooking fats, and the quality of different varieties of potatoes, soybeans, and rice grown in various localities.

The Food and Drugs Act (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1934, pp. 1-15*).—This annual report of the work of the year in the enforcement of the Federal Food and Drugs Act (E. S. R., 70, p. 557) includes among other items summaries of the food adulterations discovered involving public health, filth and decomposition, and cheats.

Among the items included in the first group were fruits and vegetables carrying excessive spray residues, canned spinach infected with *Bacillus botulinus*, confections filled with alcoholic cordials and other liquors, and Easter egg dyes containing poisonous ingredients. "Packing stock butter" and canned fish and other sea food constituted the principal items in the second group, followed by imported cacao beans, nuts, condimental seeds, and dried fruit and fruit products, both domestic and imported. The sale of oleomargarine as butter and of olive oil with large proportions of cheaper seed oils as pure olive oil were the principal items in the third group.

New analytical methods which have been developed as needed are listed.

The roasting of beef, lamb, and pork, J. A. CLINE and A. C. SWENSON (*Missouri Sta. Bul. 340 (1934), pp. 58, 59*).—This progress report (E. S. R., 70, p. 271) summarizes studies on comparisons of braising v. roasting for the less tender cuts of beef and of the searing method v. the constant temperature method of cooking beef rib, pork loin, and leg of lamb roasts.

Meat dishes at low cost (*U. S. Dept. Agr., Misc. Pub. 216 (1934), pp. 11-14, figs. 2*).—This publication has been prepared by the foods and nutrition division of the Bureau of Home Economics to meet the situation of relative scarcity of meat and the preponderance of lean meat rather than well-marbled steaks and roasts with a thick rim of fat.

Following a few general points to bear in mind in cooking less tender cuts and meat with little fat and in combining meat with other foods, selected recipes are given for braised steaks and chops; low-priced roasts; ground meat, sausage, and salt pork; quick dishes with leftovers and canned meats; soups and chowders; and liver and other meat organs.

The nutritive value of eggs, W. C. RUSSELL (*New Jersey Stat. Circ. 332* (1934), pp. 4).—A brief discussion is given of the nutritive value of eggs as sources of proteins, fats, minerals, and vitamins, their acid-forming tendency, and their energy value.

Concerning vitamin A, of which eggs are customarily considered as an important source, it is stated that the yolk of an average weight egg produced by hens receiving the type of laying ration used in New Jersey was found to contain 350 units of vitamin A. A serving of two eggs would thereby furnish only 700 units in comparison with 5,000 units for a 4-oz. serving of spinach, 2,800 units for a 3-oz. serving of carrots, 8,000 units for a 3-oz. serving of liver, 2,500 units for a 5-oz. serving of sweetpotatoes, and 1,700 units for a 2-oz. serving of butter. "Compared with certain other foods, eggs are not outstanding as a source of vitamin A, but because they are such a common article of diet they furnish a continuous supply, although small in amount."

With regard to vitamin D, one egg yolk was found to contain about one-twentieth the number of units present in one teaspoonful of cod-liver oil. "This small amount and the vitamin D that is probably developed by sunlight upon the exposed parts of the body may meet in large part any requirements of the adult human and of the growing individual, particularly in the later stages of growth." Eggs are considered a good source of vitamin B and an excellent source of vitamin G.

"Eggs are important as a source of protein, phosphorus, vitamins G and D, and easily digested fat, although they do not supply anything, with the possible exception of vitamin D, which cannot be obtained from combinations of other staple foods. Their nutritive qualities give them a place of importance in the dietary which is less than that of milk but greater than that of practically all other common foods."

High protein diets and acid-base mechanism, M. E. BELL (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1430-1437, figs. 4).—The original purpose of this study was to determine if the harmful effects reported by some authors for high protein diets may have been due to the acid-forming properties of the experimental diets used. To test this point, rats were fed diets containing 70 percent of casein and 20 and 66 percent of egg white, respectively, with and without supplements to the 5 percent McCollum salt mixture of a mixture of 10 parts of sodium citrate and 7 parts of potassium carbonate in quantities just sufficient to reduce the acidity of the urine almost to zero. The diets contained 15 percent of yeast, this amount having been found in preliminary experiments to improve the growth rate on the high protein diets over that on similar diets containing 5 percent of yeast.

The increased alkalinity did not improve the growth rate of the rats on any of the diets. The tests in which egg white was used as the protein confirmed the observations of Bateman (*E. S. R.*, 35, p. 861), Boas (*E. S. R.*, 57, p. 788), and Parsons (*E. S. R.*, 65, p. 489) that uncoagulated egg white in the diet of rats rapidly causes diarrhea, which is fatal if the diet is not improved. On the diet containing 20 percent coagulated egg white, growth was subnormal but the animals did not lose weight. On the diet containing 66 percent egg white, some of the animals developed acute nephritis and died. From examination of the feces for nitrogen and the urine for indican,

it was concluded that excessive putrefaction in the intestines occurs on the egg white diets.

Studies in avian carbohydrate metabolism.—IV, Factors influencing the maintenance of respiration in surviving brain tissue of the normal pigeon, R. A. PETERS and H. M. SINCLAIR (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1677-1686, figs. 5).—In this extension of the investigation noted previously (E. S. R., 67, p. 340), the problem of the nature of the factors responsible for the gradual fall in respiration of pigeon brains during survival in phosphate buffer solution was studied by determining the respiration rate of minced tissues from normal pigeons in the presence of various solutions.

The decrease in respiration rate was substantially reduced in the presence of lactate alone and still more so in the presence of lactate and sodium pyrophosphate and of these two substances with the addition of α -glycerophosphate. Experiments with fluoride are also reported, indicating that survival respiration in lactate-phosphate solution involves in part a hexosephosphate stage.

A study of practices in feeding infants: Results of a survey of 657 babies in villages of New York State, 1930, R. S. BIZAL ([*New York*] *Cornell Sta. Bul.* 610 (1934), pp. 34, fig. 1).—This study, which was conducted through personal visits to the mothers during the summer of 1930, is based upon records of feeding history and physical development of 657 infants from 12 to 18 mo. of age, comprising as far as possible all eligible infants in every village with a population of 2,000 or less in 16 counties in New York State. Information was also secured on the dietary habits, age, and weight of the mothers in an effort to trace factors responsible for failures in breast feeding. More than 90 percent of the infants were of American parentage. The parents for the most part were young, 31 percent of the mothers being less than 25 and 47 percent between 25 and 35 yr. of age. The homes represented a wide range of social and economic status.

Of the entire number of infants, 12 percent were never breast fed, while breast feeding was continued, for the most part without supplemental feeding, 1 mo. or less in 16 percent, 2 or 3 mo. in 15, 4 to 12 mo. in 43, and more than 12 mo. in 14 percent of the infants.

The reason most frequently given for weaning or not nursing the infants was insufficient milk (42 percent of the number). Of this group, 15 percent of the mothers reported that they used no milk during pregnancy and 20 no milk during lactation. Of the mothers who never nursed their infants, 92 percent used no milk during the lactation period. No striking correlation was shown between age or physical condition of the mothers and extent of breast feeding.

Of 645 infants included in the study of artificial feeding practices, 74 percent were given fresh cow's milk, 12 percent sweetened condensed milk, 1 percent evaporated milk, 4 percent dried milk, and 3 percent each proprietary foods made with and without cow's milk, respectively. Included in the number were 16, or 3 percent, continued on breast feeding 10 mo. or more. Of those fed cow's milk, 61 percent were given raw milk, usually modified up to the age of 4 mo. or more. "There seemed to be no difference between the physical condition or development of the children who had been given artificial food early in life and those who had been breast fed for a longer time. This is as one would expect, for, while food may affect development, the type of milk fed would exert very small influence when one considers all the factors which may affect the growth and development of an individual. Even with those babies who were fed sweetened condensed milk, no great delay in develop-

mental history was noticed. However, it appeared that the artificially fed babies were given cathartics more often than were the breast-fed babies."

The supplementary foods used, with the average ages at which they were added to the diet, were cereals 7.5 mo., fruits 8.1, vegetables 9.4, eggs 10, and meat and fish 12 mo. Nearly half of the infants had never been given cod-liver oil. There was some indication that the infants who had been given supplementary foods early in life "sat, stood, walked, and cut the first tooth earlier than did those babies who had had these foods withheld until later in infancy. This is most noticeable when vegetables, eggs, and cereals were added early to the diets."

The dietary treatment of undernutrition, E. P. RALLI and M. S. BROWN, JR. (*Med. Clin. No. Amer.*, 17 (1933), No. 1, pp. 305-316, figs. 5).—Two types of thin individuals are recognized by the authors—(1) the individual who has always been thin through an unconscious control of his appetite according to his energy requirement so that his body weight is continually below normal and (2) the individual who has lost weight through overwork or worry and is unable to regain this weight because of loss of appetite. For both of these groups the successful treatment is considered to depend upon increasing the intake of food by appetite stimulation through mental effort in the first type and overcoming a distaste for food in the second type.

Six cases are presented, 3 representing the first and 3 the second type, all of whom were able to increase their weight by a high calorie diet alone, the average gain during a period of 6 weeks being 17 lb. After a period of diet, 1 of the subjects was given insulin in doses of 20 units before each meal for a period of 3 weeks. The gain in weight during this period was less than during a corresponding period of diet alone. In all instances the desire for food returned after 5 or 6 days on the high calorie diet. It proved somewhat easier for the individuals of the second type to regain weight than for those of the first type to put on weight.

A menu is given illustrating the type of diet used. The total calorie value was 5,060 calories, of which it is estimated that the patients consumed from 4,000 to 4,040 calories daily.

The dietary treatment of undernutrition.—II, Effect of the gain in weight on carbohydrate tolerance, M. S. BROWN, JR., and E. P. RALLI (*Jour. Lab. and Clin. Med.*, 19 (1934), No. 11, pp. 1169-1172, figs. 2).—In this continuation of the series noted above, a report is given of the effect of a similar high calorie diet on the carbohydrate tolerance of 6 subjects, 4 of whom represented the first type (habitual underweight) and the other 2 the second type (recent loss in weight). The carbohydrate tolerance was measured after the ingestion of 100 g of glucose the morning before the special diet was begun and the morning after the dietary treatment was finished, from 5 to 7 weeks later.

As in the earlier study, all of the subjects gained in weight, the gains averaging 16.8 lb. for the entire period. The glucose tolerance curves were all within normal limits.

In commenting upon the two studies, the authors point out that the ability of an individual to gain weight depends upon his taking in more energy than he puts out, and that the chief effects of insulin in undernutrition is to stimulate the appetite and make it easier for the patient to increase his calorie intake. Inasmuch as a satisfactory gain of weight will follow the ingestion of a high calorie diet and an impaired tolerance for carbohydrate may follow the use of insulin in nondiabetic individuals, the indiscriminate use of insulin in undernutrition is considered inadvisable.

[Vitamin studies at the Missouri Station] (*Missouri Sta. Bul.* 340 (1934), pp. 26, 27, 59-61).—Brief progress reports are given of studies by A. G. Hogan and L. R. Richardson on the effects of ultraviolet rays on vitamin B (*E. S. R.*, 70, p. 277) (pp. 26, 27); and by B. Bisbey and S. Cover on the relationship between pH values of the contents of the intestinal tract and the deposition of calcium in the bones of rats in the presence or absence of vitamin D and Bisbey, Cover, V. Appleby, and A. Weis on the vitamin A and D content of light, medium, and dark egg yolks (*E. S. R.*, 71, p. 522) (pp. 59-61).

[Vitamin studies of the Bureau of Chemistry and Soils] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt.*, 1934, p. 23).—Data are reported on human requirements for vitamin B and the effect of spraying on the vitamin C content of Florida grapefruit.

The vitamins present in ox-serum, I, J. FINE (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1498-1500, fig. 1).—Biological tests for the presence of vitamins A and B (complex) in ox serum are reported, with the conclusion that the serum used was $\frac{1}{266}$ as potent in vitamin A as the sample of cod-liver oil used in comparison, but was lacking in vitamin B.

Studies of Chinese citrus fruits.—I, Vitamins A and B in the peels of Fu Chü (Chinese tangerine), P. P. T. SAH (*Jour. Chinese Chem. Soc.*, 1 (1933), No. 1, pp. 23-28).—Oil prepared from the peel of the Chinese tangerine by ether-alcohol extraction, followed by removal of the solvent under reduced pressure, cured ophthalmia in vitamin A-deficient rats in from 7 to 10 days when fed in doses of from 5 to 10 drops. A daily dose of 3 g of the fresh peel proved effective in both preventive and curative tests with rats on a vitamin B-(complex) free diet.

On analysis the peel was found to contain 61.25 percent of moisture and volatile matter, 0.787 percent of ash, 2.30 percent of nonvolatile ether extract, and 37.5 percent of essential oil.

Variations in vitamin A content of fish-liver oils, with particular reference to seasonal fluctuations in the potency of halibut-liver oil, J. A. LOVERN, J. R. EDISBURY, and R. A. MORTON (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1461-1469, figs. 2).—Tabulated data are given on the vitamin A content of various fish-liver oils in terms of the estimated percentages in the samples examined, as determined by the Carr-Price color test followed by spectrometric assay, and of a large number of samples of halibut-liver oil.

The data for the different kinds of oil point to the conclusion that "the liver oils of haddock, whiting, skate of small or medium size, codling, and immature or small fish generally are markedly inferior in vitamin A potency to average cod-liver oil. The oils from pollack, saithe, hake, and ling (probably also torsk) are usually similar in potency to cod-liver oil and subject to roughly the same variations. Salmon, turbot, sturgeon, and halibut yield liver oils which are vastly richer in vitamin A than cod-liver oil. The richer the source the more widely does the potency appear to vary as between sample and sample."

Within a given species the content of vitamin A appeared to increase with the size or age of the fish and to vary with the sexual condition and diet, the last two factors accounting largely for seasonal changes. During spawning the concentration of oil in the liver is decreased to a greater extent than that of vitamin A, so that at this season the concentration is higher than during normal feeding. The greater part of the carotene annually produced by diatoms and available for conversion into vitamin A is synthesized during a com-

paratively short period in the spring or early summer, following which, after a certain time lag, the vitamin A content in the liver increases. The increase of vitamin A with age is thought to be chiefly a matter of storage.

Halibut-liver oil, as noted in a preliminary report (E. S. R., 67, p. 777), is shown not only to be by far the richest known source of vitamin A but also to vary in potency over a wider range than any other source. The content of vitamin A in the oils examined ranged from 0.17 to 10 percent of the oil. Well-marked seasonal fluctuations in vitamin A concentration were noted which could not be attributed entirely to changes in the oil content of the liver as the result of spawning.

"The best oils from the standpoint of vitamin A content are most likely to be obtained from large halibut caught in northern waters in the late spring or early summer, and in the autumn. Very rich oils at other times of the year are exceptional."

The diet of the halibut and intensity of feeding in relation to the vitamin A potency of the liver oil, J. A. LOVERN and J. G. SHARP (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1470-1472).—Examination of the stomach contents of halibut and of the glycogen content of halibut liver in comparison with the vitamin A content of the liver oil showed no exceptional richness in the vitamin A of the diet and no correlation between the intensity of the feeding as determined by the glycogen content of the liver and vitamin A potency.

Studies of the alleged toxic action of cod liver oil and concentrates of vitamin A, M. E. BELL, E. GREGORY, and J. C. DRUMMOND (*Ztschr. Vitaminforsch.*, 2 (1933) No. 3, pp. 161-182, figs. 10; *Ger., Fr. abs.*, pp. 180, 181).—Rats on a diet of "light white" casein 20, rice starch 75, and McCollum's salt mixture 5 parts, with vitamin B supplied by an alcohol concentrate of brewery yeast or by 5 percent of dried yeast in the diet, were given massive doses of cod-liver oil (15 percent of the diet), of various vitamin A concentrates (as much as 2,000 times the amount required for normal growth), and of carotene (approximately 1,300 times the normal dose). In the experiments with the vitamin A concentrate and carotene, vitamin D was supplied by irradiated yeast, and in some instances the vitamin B content of the diet was increased by the administration of larger quantities of yeast or yeast extract.

In the cod-liver oil experiments growth was subnormal on the high concentration of oil, and in some of the animals this subnormal growth was associated with the condition known as "scaly tail." No lesions of the heart muscles, arteries, liver, or kidneys could be detected even after several months on the cod-liver oil rich diet. When the amount of the vitamin B complex was increased, growth and the general condition of the animals were improved.

There was no evidence of toxicity in the experiments in which the vitamin A was supplied by a concentrate or by carotene, thus indicating that the toxicity of the cod-liver oil is not due to vitamin A. Attempts to discover the cause of the toxicity gave negative results. It could not be ascribed to putrefaction or oxidation products, and there was no evidence of any failure of assimilation or digestion of the oil. Calcium and phosphorus determinations showed no abnormalities attributable to the high intake of vitamin D in the cod-liver oil.

"It must be emphasized that the doses investigated in this work are proportionately far outside those commonly employed in therapeutics. There is not the slightest foundation for believing that the doses of cod-liver oil usually given to humans are likely to have any deleterious action."

Experiments in rats as evidences of the toxical influences of cod liver oil in man! E. AGDUHR (*Ztschr. Vitaminforsch.*, 3 (1934), No. 2, pp. 99-102).—

Exception is taken to the conclusions of Bell et al. noted above, on the ground that the experimental work on which these conclusions were based was carried out on rats which, according to the author's experience, are the least susceptible of all experimental animals to cod-liver oil toxicity. Clinical observations reported in Scandinavian medical literature are reviewed in illustration of the functional and histological lesions attributable to overdosage of cod-liver oil.

Is there a vitamin A hypervitaminosis? [trans. title] G. Rossi (*Ztschr. Vitaminforsch.*, 2 (1933), No. 3, pp. 194-207, figs. 6; Eng., Fr. abs., pp. 206, 207).—Young rabbits and guinea pigs showed no ill effects after prolonged treatment with massive doses of vitamin A (from 6,000 to 1,000 antixerophthalmic units), but rats showed a slight retardation of growth. Large doses of vitamin A combined with overdosage of vitamin D retarded growth in rabbits. Both rabbits and guinea pigs showed no ill effects after subsisting for some time on large amounts of carrots, 250 g daily for rabbits and 200 g for guinea pigs. The vitamin A appeared to have a favorable effect on hemoglobin formation in both cases.

It is noted that the dosage of vitamin A concentrate corresponds to the maximum dosage recommended for adults.

The B vitamins [trans. title], H. SIMONNET (*Ztschr. Vitaminforsch.*, 2 (1933), Nos. 1, pp. 28-47, pl. 1; 2, pp. 94-109).—This extensive review of the literature includes a summary of present knowledge concerning vitamins B₁ and B₂ under the headings of proof of existence, determination, properties, isolation, and chemical nature. This is followed by a discussion of these two vitamins in clinical medicine, brief summaries of the status of knowledge at the time of writing of vitamins B₃, B₄, B₅, and Y, and a discussion of the significance of the B vitamins in relation to micro-organisms. About 300 references to the literature are given.

The determination of the antineuritic vitamin, K. H. COWARD, J. H. BURN, H. W. LING, and B. G. E. MORGAN (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1719-1743, figs. 8).—Included in this extensive report, which should be studied in the original, are new or modified methods for estimating the potency of preparations containing vitamin B₁ by means of (1) tests in which pigeons are cured of head retraction and (2) tests based upon the growth of rats. Data are included on the application of the methods to the quantitative determination of vitamin B₁ in various preparations in comparison with the international standard. Statistical analyses of these data indicate that the probable errors of the tests, using 9 animals in a test, are +31 or -26 percent for duration of cure and +29 or -23 percent for the percentage cured in the pigeon tests, and +6.1 or -5.5 percent for the mean increase in weight in 3 weeks in the rat test.

"In spite of the probable error of the pigeon test being much greater than that of the rat test, the former has the great advantage of being specific for the factor it is used to estimate. It may also be that it gives a truer result with certain substances (e. g., dried yeast) than the rat test, though it may be difficult to use the polyneuritic pigeon for testing many substances which cannot be suspended in water and given by a stomach tube."

Note on the incidence of dermatitis among rats deprived of vitamin B₂, M. H. ROSCOE (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1533-1536).—Data on the incidence of dermatitis in all of the vitamin B₂-deficient animals observed by the author during a period of 7 yr. are summarized, together with the results of attempts to discover the factors influencing the incidence of dermatitis.

Dermatitis occurred in 108 out of 191 rats fed various vitamin B₂-deficient diets for an average period of 10 weeks. The development of dermatitis bore no relation to the time of year, the extent of growth on the deficient diet, or the state of purification of the casein of the diet. Alterations in the basal diet, such as the 17 percent sucrose diet recommended by Leader (E. S. R., 64, p. 595) or the fat-free diet of Evans and Lepkovsky (E. S. R., 62, p. 293), had no influence on the incidence of the dermatitis.

The vitamin B₂ content of various materials compared by their power to promote growth and to cure dermatitis, respectively, M. H. Roscoe (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1537-1539).—A comparison of the daily doses of various materials needed by young rats as the sole source of vitamin B₂ (1) to promote a 50- to 60-g weight increase in 5 weeks and (2) to cure dermatitis, as described in the paper noted above, is reported with results indicating that "within the large experimental error unavoidable in this type of experiment, the dermatitis-curing and growth-promoting factors have a similar relative distribution in the materials tested, yeast extract, egg white filtrate, and meat, and that they are similarly affected by heat in acid and alkaline media, both being much more sensitive in the latter case. . . . It is therefore concluded that the two factors are identical."

The theory postulating the existence of separate dietary factors for the prevention and cure of dermatitis and for the promotion of growth is considered untenable.

Studies on vitamin C [trans. title], W. M. CAHILL (*Bul. Soc. Chim. Biol.*, 15 (1933), No. 10, pp. 1462-1471, figs. 3).—Grape juice preserved in barrels without fermentation or oxidation was found to have no antiscorbutic properties when tested in 20 cc daily doses on 275-g guinea pigs. The juice was found to contain a small quantity of a hexuronic acid possessing some but not all of the properties of ascorbic acid. The hexuronic acid in doses of 2 mg per guinea pig per day had no antiscorbutic action. An isomer of hexuronic acid, 5 keto-gluconic acid, was also tested biologically and found ineffective in 3 mg daily doses.

The action of vitamin C on the oxidation of tissues in vitro, D. C. HARRISON (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1501-1505).—The earlier suggestion of Szent-Györgyi (E. S. R., 67, p. 645) that hexuronic acid (ascorbic acid) may play the part of an intermediary hydrogen carrier in tissue respiration was tested in vitro by measuring the surviving respiration of tissues from normal and scorbutic guinea pigs manometrically in oxygen, with and without the addition of ascorbic acid in concentrations considered not physiologically excessive. "With scorbutic animals, using thin slices of liver suspended in phosphate buffer (pH 7.4), the oxygen uptake is lower than that of liver from normal animals. The addition of 0.25 mg of ascorbic acid in 3 cc brings about an increase in the oxygen uptake of scorbutic liver slices amounting to 5 to 57 percent (average 25 percent). With normal guinea pigs, the oxygen uptake of the liver was unaffected or even slightly decreased by the addition of 0.25 mg of ascorbic acid. Using chopped muscle, the oxygen uptake with normal guinea pigs was slightly increased with 0.1 to 0.25 mg ascorbic acid, while with muscle from guinea pigs suffering from scurvy a relatively large increase in oxygen uptake was obtained."

Commenting upon these results, the authors suggest that impeded oxidation in the scorbutic animal may lead to loss of tone in the capillary muscles, followed by increased permeability and the characteristic hemorrhages of scurvy.

The excretion of vitamin C in human urine and its dependence on the dietary intake, L. J. HARRIS, S. N. RAY, and A. WARD (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2011-2015, figs. 3).—The microtitration method of Birch et al. (*E. S. R.*, 70, p. 741) has been applied to the determination of the vitamin C content of human urine. Certain precautions which must be taken in using the method are described, and data are reported on the values obtained in two experiments. The subject in one case drank 600 cc of orange juice at one time and then lived on a vitamin C-free diet for several days, and in the other the same subject consumed 556 mg of ascorbic acid, an amount equivalent to 600 cc of orange juice, at one time and then continued on a vitamin C-free diet for more than 2 weeks.

In both experiments the ingestion of the large amount of vitamin C was followed within an hour by very marked increase in output of the vitamin in the urine, reaching a maximum in about 3 hr. of from 7 to 10 times the normal value and subsequently dropping within a day or two to a more or less steady value of about 33 mg daily. Tests on the urine of 4 normal individuals on an ordinary mixed diet are also reported. The averages for 24 hr. for 3 of the subjects were 0.032, 0.024, and 0.028 mg per cubic centimeter, respectively. The urine of the fourth subject was too dilute to permit the reading of clear end points in the titration.

It is pointed out that the fairly constant excretion value of about 33 mg a day is slightly larger than the reputed minimum need of 1 oz. of orange juice or lemon juice per day, an amount which would furnish about 20 mg of ascorbic acid. The method is thought to have promise for the diagnosis of hypovitaminosis C in human beings.

Evaluation of the capillary resistance test in the diagnosis of subclinical scurvy, D. GREENE (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 1, pp. 4-6).—This paper reports an investigation of the reliability of the Göthlin capillary resistance test for the diagnosis of subclinical scurvy. Previous reports by Dalldorf and by Stocking have been noted (*E. S. R.*, 70, p. 728; 71, p. 283).

The first study was carried on at the Home for Hebrew Infants, New York City, on a group of 23 healthy young children from 19 to 40 months of age, all of whom were considered to have received adequate antiscorbutic protection. Of the entire number, five showed positive tests on a single examination. To three of these an additional amount (60 cc) of orange juice was given daily for three weeks, after which the test was again made, with positive results for two of the three children.

The next group studied consisted of 65 school children from 9 to 14 years of age who were tested at frequent but irregular intervals for over a year. These children, mostly of Jewish extraction, were exceedingly well nourished and were considered to be receiving sufficient vitamin C in the diet. Six of this group showed positive reactions at one time or another. Not only were there marked variations in the test from time to time, but in some instances the results were positive on one arm and negative on the other.

The final group tested consisted of 16 malnourished school children of varied nationality. In this group there were two positive cases.

"From these studies, which show a positive capillary fragility test in 21.7 percent of a group of well-nourished children of preschool age, and in 9.2 percent of well-nourished school children receiving abundant vitamin C supplements to their diet, and in 12.5 percent of malnourished school children with a small supply of vitamin C, it may be concluded that a positive reaction to the

capillary resistance test does not necessarily denote an insufficient vitamin C intake."

The antiscorbutic potency of apples grown in Czechoslovakia in comparison with that of foreign fruits [trans. title], H. PELC and M. PODZIMKOVÁ (*Trav. Inst. Hyg. Pub. Tchecoslov.*, 3 (1932), No. 3, pp. 57-78, pl. 1, figs. 2).—In this comparison of native fall apples (Czechoslovakia) with imported oranges and bananas as a source of vitamin C, the apples were found to be a rather poor source of this vitamin in the fall and almost valueless in the spring, when the daily addition of 20 g to the basal scurvy-producing diet of guinea pigs was almost without effect. The juice of oranges available on the market in autumn and early winter proved insufficient in 5-cc daily doses, but bananas were protective over a considerable period of time in 20-g doses.

The antiscorbutic properties of early and late potatoes grown in Czechoslovakia [trans. title], H. PELC and M. PODZIMKOVÁ (*Trav. Inst. Hyg. Pub. Tchecoslov.*, 4 (1933), No. 4, pp. 119-138, figs. 2).—The freshly pressed juice of a variety of early potatoes was found to contain 1 international unit of vitamin C per cubic centimeter, while that of a later variety tested in the spring contained only about one-twentieth as much. The materials were standardized against fresh lemon juice, 1 cc of which contained 10 international units. In experiments in which cooked late potatoes constituted 50 percent of the diet, 30 g consumed daily by the experimental guinea pigs was found to furnish about 0.75 international unit of vitamin C.

In the authors' opinion cases of incipient scurvy are much more frequent than clinical diagnoses would lead one to infer. For this reason an increase in consumption of potatoes, with perhaps a decrease in that of cereals, is urged during the late winter and spring when fresh fruits and vegetables are less available.

Scorbutic changes in the teeth and the influence on them of synthetic vitamin C preparations [trans. title], G. WESTIN (*Ztschr. Vitaminforsch.*, 2 (1933), No. 1, pp. 1-24, pls. 6; *Eng., Fr. abs.*, pp. 22, 23).—Of particular interest in this report is the description of a modification of the method of testing for vitamin C by histological examination of the teeth of the experimental guinea pigs. This consists in using both horizontal and longitudinal sections. Photographs are given, showing the method of sectioning, with microphotographs of both horizontal and longitudinal sections.

The occurrence of vitamin E in soy bean oil, U. SUZUKI, W. NAKAHARA, and Y. SAHASHI (*Bul. Agr. Chem. Soc. Japan*, 10 (1934), No. 4-6, pp. 87-89, fig. 1).—Thirteen male rats in the study noted previously (*E. S. R.*, 72, p. 284), distributed fairly evenly as to diet, were autopsied at the end of the experiment with no findings of significance except in the testicles, which were in a state of marked degeneration in the animals on all of the diets except the ones containing soybean oil (3 animals), and butter (1 animal). These observations, together with preliminary findings in experiments testing the reproductive capacity of rats on synthetic diets in which soybean oil was the only possible source of vitamin E, have led to the conclusion that soybean oil contains vitamin E.

The role of the gastro-intestinal tract in conditioning deficiency disease, M. B. STRAUSS (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 1, pp. 1-4).—The concept that "deficiency disease in man may and frequently does develop because of some disturbance of the gastro-intestinal tract in spite of an apparently adequate diet" is developed, with clinical evidence to illustrate this view

with regard to pernicious anemia, pellagra, multiple neuritis (beriberi), and other conditions. Many references to the literature are included.

The effect of various colloidal and crystalloidal metallic compounds in nutritional anemia of the rat, H. L. KEIL and V. E. NELSON (*Jour. Lab. and Clin. Med.*, 19 (1934), No. 10, pp. 1083-1088).—Tests of various substances for their property to regenerate hemoglobin in rats rendered anemic on whole milk, collected in glass bottles to avoid contamination with metallic salts, are reported in continuation of previous studies (E. S. R., 67, p. 348) and with the following conclusions:

"Manganese cannot replace Cu in the synthesis of hemoglobin. Colloidal Fe and Cu are utilized in hematopoiesis. Although the intraperitoneal injection of Fe salts into anemic animals causes a temporary rise in hemoglobin, it is evident that the main function of Cu is not in the absorption of iron. Zinc and Mg have no effect in the development of anemia. Two-thousandths (0.002) mg Cu as $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and 0.10 mg Fe as colloidal $\text{Fe}(\text{OH})_3$ are the minimum amounts of these elements that will cause a regeneration of the hemoglobin to a normal level in the anemic rat. Cu_2O , CuS , $\text{Cu}(\text{OH})_2$, and CuI are readily utilized by the anemic rat in hemoglobin building. The sulfide is less efficient than the other salts employed."

Cottonseed allergy, S. J. TAUB (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 5, pp. 334, 335).—Among 246 allergic patients who were given complete skin (scratch) tests with about 300 separate allergens, 13 reacted specifically to cottonseed. Of this group, 6 patients had asthma, 2 eczema, and 3 perennial hay fever.

It is noted that cottonseed-sensitive patients "also manifest a tendency toward hypersensitiveness to other seeds and to members of the pea, bean, and nut families.

"The active principle in cottonseed is probably a protein. Clinically, these patients can tolerate contact with cotton fiber of the highest grade without difficulty, but they are troubled by cheaper products which contain some of the seed."

Various sources of the cottonseed which may produce allergy are listed in groups under headings ingestant, contactant, and inhalant.

Creatinuria in adolescent males.—II, The effects of the oral administration of ephedrine sulphate, A. B. LIGHT and C. R. WARREN (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 6, pp. 410, 411).—In continuation of the study noted previously (E. S. R., 71, p. 571), ephedrine sulfate in 25 mg doses was administered 3 or 4 times during a single day to 9 of the subjects of the earlier study who ordinarily excreted creatine. Creatine and creatinine determinations were made on the urine the day of treatment, as well as the day before and after the treatment. There was no change in diet or in the customary exercise.

During the control days the average excretions of creatine were 71 and 62 mg, respectively, while on the day of the ephedrine treatment the creatine excretions ranged from 1 to 9 mg with an average of 4 mg. There were no significant changes in preformed creatinine.

On the relation between kidneystone- and bladderstone-formation and nutrition, A. POLAK (*Arch. Néerland. Physiol. Homme et Anim.*, 19 (1934), No. 2, pp. 176-190).—Several groups of rats were fed diets deficient in vitamin A but with various salt additions and similar diets supplemented with vitamin A. After death the animals were autopsied for occurrence of kidney and bladder

stones. Some of the groups were the same as in the study reported by Arons and Van der Rijst (E. S. R., 69, p. 151).

Excess calcium carbonate (3 percent) in the diet appeared to be responsible for a higher incidence of both kidney and bladder stones than did the absence of vitamin A. Although there were some instances of both kidney and bladder stones in the animals on diets deficient in vitamin A, the incidence of one or both of these conditions was almost 100 percent in a group of 24 rats fed a diet containing sufficient vitamin A, as well as other food essentials, but with 3 percent calcium carbonate added.

"In how far our investigations will also be of importance for human pathology cannot yet be decided, as the pathology of rats cannot be a priori considered to be identical with human pathology. Nevertheless, it may be advisable in any case to be cautious when administering large quantities of calcium, as it is by no means impossible that this may have detrimental consequences in human beings too."

A new pathogenesis and therapy for psoriasis [trans. title], O. GRÜTZ (*Deut. Med. Wchnschr.*, 60 (1934), No. 28, pp. 1039-1043).—The theory is advanced that psoriasis is a special form of lipoidosis caused by disturbed fat metabolism. Dietary treatment for the condition is discussed, with clinical observations.

Cereals and rickets, IV, V, V. M. TEMPLIN and H. STEENBOCK (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2055-2068).—In continuation of this series of studies at the Wisconsin Experiment Station (E. S. R., 63, p. 295), two papers are presented.

IV. The effect of immaturity of the maize kernel upon its rachitogenic properties (pp. 2055-2060).—Immature and mature corn of both the field and sweet type were compared for calcifying properties when constituting the cereal part of the Steenbock-Black rickets-producing ration 2965.

As determined by the usual criteria for calcification (blood and bone analyses and line test), the immature yellow dent field corn promoted better calcification than the corresponding mature corn and a commercial canned sweet corn better calcification than the seed from which it had been grown. The differences in calcifying properties could not be explained by differences in the calcium : phosphorus ratios.

V. The effect of germination and autolysis on the rachitogenic properties of the maize kernel (pp. 2061-2068).—Using the same procedure as in the preceding study, an examination was made of the effect of germination and heat treatment of corn on its behavior in a rickets-producing ration, with results which are summarized as follows:

"Yellow maize germinated for 95 hr., with roots not exceeding 4 in. in length, was found as rachitogenic as ungerminated maize. Germinated maize dried below 50° (C.) had practically the same rachitogenic properties as the maize from which it had been prepared. Autolyzed germinated maize was definitely less rachitogenic than germinated or untreated maize. The anti-rachitic effect of autolyzed germinated maize was most pronounced in maize which had been germinated for a long period of time."

A tuberculosis survey among 2,000 food-handlers in New York City, D. C. MARTIN, H. T. PESSAR, and J. A. GOLDBERG (*Amer. Rev. Tuberc.*, 29 (1934), No. 2, pp. 182-189).—In a tuberculosis survey of 2,000 apparently healthy food handlers in New York City, X-ray examination revealed active tuberculous pulmonary lesions to the extent of approximately 2 percent, with evidence of

healed childhood lesions in about 8 percent and latent adult tuberculosis in about 2 percent of the entire number. From the percentage of active pulmonary lesions it is estimated that in New York City, with a food-handling population of more than 325,000 individuals, there are not less than 6,500 cases of unknown and therefore uncontrolled pulmonary tuberculosis.

The percentage incidence of active tuberculosis is thought to represent the average situation in all large urban communities and to indicate that there is a very definite problem for public health administrators in tuberculosis prevention and control.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1934, pp. 10-13*).—This annual report of the textiles and clothing division (*E. S. R., 70, p. 573*) includes summaries of its work on the wearing qualities of cotton sheets and wool blankets.

Studies of wool and other fibers (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1934, p. 11*).—Wool research reported on briefly included shrinkage tests on light, medium, and heavy fleeces by a simplified method (*E. S. R., 72, p. 139*), effects of proper feeding on length of wool, breaking strength and stretch tests on fabrics containing new and reworked wool in various combinations, and the development of a fiber holder and a cross-section device for the study of wool fibers.

Dye absorption of cotton fibers, W. M. MEBANE and A. A. O'KELLY (*Amer. Dyestuff Rptr., 23 (1934), No. 15, pp. 393-395, 418-420, figs. 4*).—When samples of bleached and unbleached, mercerized, bleached and unbleached oxidized, and bleached and unbleached tendered cotton domestic were analyzed microscopically at the Tennessee State Teachers College (Murfreesboro), fiber counts on the original cloth showed green fibers 4 percent, underripe 20, normal 53, overripe 17, and dead fibers 6 percent. A slightly smaller percentage of green and dead fibers was noted in the finished fabrics. See also an earlier note by Mebane and Vilbrandt (*E. S. R., 55, p. 295*).

Examination of samples after dyeing with an acid, a basic, a mordant, a direct, an indirect, and a vat dye revealed that green fibers failed to dye properly under any of the conditions given, although best results were obtained from the direct dye. Underripe fibers seemed to take dye better than green fibers, but not nearly as well as normal fibers. The effect of chemical treatment, well illustrated by the normal fibers, corresponded with previous findings of others. In all types of fibers the unbleached showed more spottiness than the bleached. Oxidation showed a heavy increase in dyeing, mercerization gave the expected results, and tendering caused the expected heavy dyeing by the basic dye. As in the underripe fiber, most of the dye appeared to be in the lumens. All of the overripe fibers showed an abnormally heavy dyeing, except with the basic dye on the mercerized samples. The results indicated that the various chemical treatments tend to increase the ability of overripe fibers to absorb dye materials or lakes, and it was concluded that overripe fibers possess a much greater porosity and more accessible lumen than normal fibers.

Although dead fibers seemed to be physically and chemically different from green fibers, they gave almost the same results. The dyeing of bleached, unbleached, and oxidized dead fibers by the basic dye indicated a chemical nature receptive to basic dye, but tendering did not increase dyeing. Dead fibers absorbed no more dye than green fibers, except after mercerization. A practical

conclusion is that cotton picked under conditions most favorable to produce normal fibers gives the best results when dyed.

The durability of cotton fabrics, A. E. GINTER, S. DAVIDSON, and T. PEARSON (*Missouri Sta. Bul.* 340 (1934), p. 61).—This progress report (E. S. R., 70, p. 286) discusses predictions that can be made as to serviceability of cotton fabrics from tensile strength measurements.

The effect of atmospheric sulphur dioxide on cotton textiles, O. M. MORGAN and B. J. KENALTY (*Canad. Jour. Res.*, 11 (1934), No. 1, pp. 53-61, fig. 1).—When cotton sheeting, wet with solutions such as encountered in power laundry rinse waters, was dried in air containing 1 and 2 p. p. m. of sulfur dioxide and with such factors as SO₂ concentration, humidity, temperature, and light kept under control, the sulfur dioxide was found to have little or no effect in deteriorating the fabric.

HOME MANAGEMENT AND EQUIPMENT

A study of expenditures for family living by 46 South Carolina rural families, M. E. FRAYSER (*South Carolina Sta. Bul.* 299 (1934), pp. 32, figs. 3).—This bulletin summarizes account book records kept by 46 families in 6 agricultural counties in the State for 1 yr., starting in the spring of 1932. All of the subjects, of whom 40 were farm owners and 6 tenants, were Anglo-Saxon and belonged to the more stable portion of the rural population. The farms averaged 27 acres each, with an average of 99 acres under cultivation. Cotton and corn were the principal crops raised, with some dairying, poultry, and hog raising and general crop production. The average size of the family was 4.5 persons and the average ages of the farm operator and homemaker were 49 and 47 yr., respectively. All but 3 of the women and 6 of the men had completed the seventh grade in school, and approximately one-fifth of both the men and women had attended college.

The range of total annual cash income was from \$92 to \$1,806, with an average of \$555. About 25 percent of the cash came from the homemaker's earnings from special types of farm and home enterprises, 23 percent from farm earnings, 7 percent from the sale of investments and borrowed money, and 45 percent from miscellaneous sources, including supplementary occupations of the heads of the families and contributions from children not living at home.

The average value of the family living was \$958, of which \$485 represented the net cash expenditures for family needs and \$473 the estimated contribution from the farm. The cash expenditures included food \$99, operating \$64, furnishings and equipment \$18, rent \$7, clothing \$75, savings and investment \$43, and general expenditures \$179. Of the last item, the largest expenditure was for automobile \$52, followed by health \$30, education \$34, church and community welfare \$28, gifts \$15, recreation \$10, and personal \$10. The contributions from the farm included food \$284, fuel \$28, and house rental \$161.

The money values of the diets ranged from \$0.075 to \$0.354, with an average of \$0.195, per person per day. The records indicated that the dietary needs of some of the families were not met adequately, particularly as regards milk, lean meat, vegetables, and fruit.

The various items are compared with corresponding ones from reported studies in other States, with the conclusion that the average total value of living is lowest for South Carolina, but that the percentage supplied by the farm to the total living is the highest.

An appendix contains the itemized values of the family living for the individual families.

Farm-housing survey (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1934, pp. 1, 2*).—A brief summary is given of the scope and findings in the farm housing survey made by the Bureaus of Home Economics and Agricultural Engineering, with financial support from the CWA.

Ovenware and fuel economy, C. J. PHILLIPS and M. L. NORDBERG (*Jour. Home Econ., 26 (1934), No. 1, pp. 37-41, figs. 2*).—Differences reported by Swartz (*E. S. R., 65, p. 287*) and others in the rate of heating utensils of different materials in an electric oven are explained by an analysis of the heating process in an oven, with data showing that in both gas and electric ovens the proportion of radiation heating is much higher than of convection heating and that utensils of different materials absorb the radiant heat to an unlike degree, glass absorbing about 95 percent of the radiation striking it and shiny tinware only about 8 percent.

Data are also given showing the much more rapid evaporation of water from glass than from tinware dishes in electric and gas ovens at different temperatures, the higher temperature required for an equal degree of evaporation of water from tinware than from glass, and the longer time, with resulting increase in cost, of bringing foods to a certain temperature or cooking to a certain doneness in tinware than in glass.

Thermal efficiency of cooking utensils as affected by variations in the area of their contact with the heating surface, M. M. MONROE and L. SMITH (*Jour. Home Econ., 26 (1934), No. 1, pp. 42-45*).—In this contribution from the Maine Experiment Station, attention is called to the importance of evenness of the heating surface or area of contact between the cooking utensil and the heating surface in controlling the efficiency of cooking utensils on surface units. Data are reported showing that variability in area of contact among different commercial specimens of the same model may have more effect on efficiency than other factors, such as thickness and composition. From the standpoint of practical application "manufacturers should provide utensils with smooth, level bottoms sufficiently rigid and substantial in construction to be subject only to the minimum amount of warping, buckling, or denting with use. Housewives should employ such precautions in use and cleaning as will damage this surface least."

A method for determining quantitatively the comparative ability of electric cleaners to remove dirt from rugs and carpets, M. E. DILTS (*Jour. Home Econ., 26 (1934), No. 3, pp. 172-176, figs. 2*).—The method described was developed in a large industrial laboratory as part of an extensive research program covering a period of approximately 15 yr. The equipment and procedure are described, and data are summarized from a series of 20 field tests made in local homes on rugs in everyday use. Reasons are given for the preference of naturally v. artificially soiled carpets in testing the performance of electric cleaners.

MISCELLANEOUS

Work of the [Missouri] Agricultural Experiment Station, [1933], F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 340 (1934), pp. 91, figs. 10*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Our changing agriculture served by science: Annual report of the director, [Wisconsin Station, 1933], compiled by N. CLARK (*Wisconsin Sta. Bul. 428 (1934), pp. 128, figs. 22*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Massachusetts Station.—Dr. Helen S. Mitchell, professor of physiology and nutrition at Battle Creek College, has been appointed research professor in home economics, effective February 11, succeeding Dr. Bernice C. Wait resigned.

Michigan College.—Dr. Frank S. Kedzie, associated with the institution for most of his life and president from 1916 to 1921, died January 5, aged 77 yr. He was graduated from the college in 1877 and became assistant in chemistry in 1880, instructor in 1883, and later head of the department and acting president in 1915. In 1921 he became dean of the newly established department of applied science and retired in 1927 with the honorary position of college historian. He left a trust fund of \$50,000 to be used exclusively in purchases of books and periodicals on chemical subjects in what is to be known as the Frank S. and Kate M. Kedzie Chemical Library.

Nebraska Station.—James A. Holden, superintendent of the Scotts Bluff Substation since 1917, died December 6, 1934. Lionel Harris has been appointed acting superintendent.

New Jersey Stations.—Dr. Robert C. Burdette, associate entomologist since 1928, died January 6. He was born in Woodfield, Md., in 1898, received from the University of Maryland the B. S. degree in 1923 and the M. S. degree in 1925, as well as the Ph. D. degree in 1932. He was a research assistant in the Maryland Station in 1924-25 and junior entomologist in the U. S. D. A. Bureau of Entomology from 1925 to 1927.

North Dakota Station.—E. G. Schollander, superintendent of the Williston Substation, resigned February 12 to accept an appointment with the rural rehabilitation work of the Federal Emergency Relief Administration for North Dakota. Clarence H. Plath, superintendent of the Hettinger Substation, has also resigned to become consultant of the National Resources Board. Herman Oehlke and Christian Bjornson have been added to the station staff, the former as a field man on a Purnell project involving a study of taxation in relation to farm indebtedness in North Dakota and the latter in a similar capacity on a Purnell project involving a study of farm leases as related to farm productivity and rent and debt adjustment.

Ohio Station.—Dr. J. S. Shoemaker, associate horticulturist, has resigned to accept a position with the University of Alberta. Recent appointments include A. F. Schalk as associate in animal industry and Dr. W. E. Dunham, Leon Havis, and Norma A. Frank as assistants in entomology, horticulture, and animal industry, respectively.

Pennsylvania College.—Grace P. Bacon, assistant professor of nutrition extension, died December 25, 1934, from injuries received in an automobile accident. She was a 1912 graduate of the Michigan College.

South Dakota College and Station.—A new department to handle all photographic work of the college, the station, and the extension service has been established with Earl R. Bales in charge. Dr. John P. Johansen has been appointed assistant professor of rural sociology vice Dr. Paul H. Landis, who had been appointed associate consultant of the National Resources Board for South Dakota. Alvin L. Moxon has been appointed analyst in chemistry in the station vice Florence M. Marx resigned.

Wisconsin University and Station.—The retirement after 40 years' continuous service is announced of R. A. Moore, head of the department of agronomy, effective June 30. He will be succeeded by Olaf S. Aamodt, head of the department of field crops of the University of Alberta.

New Journals.—*Bioklimatische Beiblätter der Meteorologischen Zeitschrift* is being issued quarterly at Braunschweig (Brunswick), Germany, as a medium for the publication of original papers covering the border line between medicine, botany, zoology, and ecology on the one side and climatology and meteorology on the other. The initial number contains articles entitled Bioclimate as Small-Scale Climate and Microclimate, by W. Schmidt (pp. 3-6); The Connection between Radiation and Duration of Sunshine, by A. Ångström (pp. 6-10); Artificial Ionization with Different Sources of Ionization and Their Variability in a Small Closed Space, by L. Schulz (pp. 11-15); The Influence of the Weather on Marine Life, by F. Ruttner (pp. 16-19); The Significance of the "Storm-Effects Paradox" in the Plant Climate of the Mountain Forelands, by L. Aujeszký (pp. 19-21); The Increased Tension in the Electrical Field through Soil Mulching, by J. O. Musso (pp. 21-25); The Cooling Influence of Winds on Clothing, by J. Siegenthaler (pp. 25-28); and Climate and Soil Microbiology, by A. von Szilvinyi (pp. 29-32), as well as shorter articles and abstracts.

American Journal of Digestive Diseases and Nutrition is being published monthly at Fort Wayne, Ind., including original contributions, editorials, book reviews, abstracts, and other material in the field of digestive diseases and nutrition. The initial number contains an article on Nutrition in Health and Disease, by C. J. Barborka (pp. 44-49).

Revista do Departamento Nacional da Produção Animal is being published as the official journal of the Ministry of Agriculture by the Institute of Animal Biology at Rio de Janeiro, replacing the *Revista de Zootechnia e Veterinaria*. Among the articles in the first number are those entitled Parasites of the Nervous System named *Neuroplasma viannae* and *N. caviae*, by V. dos Santo (pp. 27, 28); A Common Grain Moth (*Tinea granella* L.) Injurious to Sausage Meat, by A. Ronna (pp. 29-39); The Presence of *Bacillus proteus* in the Blood of Calves with Diarrhea, by A. Braga and A. Lombardo (pp. 41-48); Venezuela or Imperial Pasture Grass (*Axonopus scoparius* Flüge) Hitch (pp. 55-63); and numerous abstracts and other material. English abstracts of most of the articles are provided.

Revista Sudamericana de Botanica is being published at Montevideo, Uruguay, by the South American Botanical Association. It is the aim of this journal to publish original articles in the entire botanical field. The initial number contains, among others, an article in English entitled Heredity and Environment in Relation to Character Expression with Special Reference to Intermittent Characters in *Equisetum*, by J. H. Schaffner of Ohio State University (pp. 8-17).

Research and Progress, a quarterly review of German science, is being published in English under the editorship of Dr. Karl Kerkhof at Terramare Office, Berlin, W 8. Among the 16 articles to be included in the initial number are the following: Progress in the Physiology of Nutrition, by E. Abderhalden (pp. 19-23), and The Latest Tobacco Research, by P. Koenig (pp. 23-25).

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

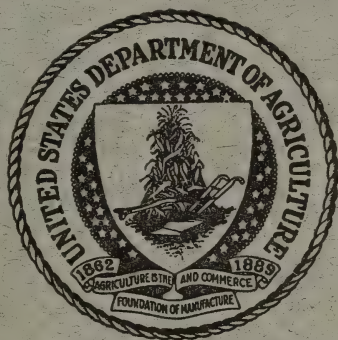
U. S. Department of Agriculture

Vol. 72

MAY 1935

No. 5

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

Editor: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment—
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOL. 72, NO. 5

Editorial:	Page
Recent progress in the coordination of agricultural research.....	577
Recent work in agricultural science.....	581
Agricultural and biological chemistry.....	581
Agricultural meteorology.....	588
Soils—fertilizers.....	589
Agricultural botany.....	593
Genetics.....	598
Field crops.....	605
Horticulture.....	616
Forestry.....	628
Diseases of plants.....	629
Economic zoology—entomology.....	650
Animal production.....	670
Dairy farming—dairying.....	680
Veterinary medicine.....	688
Agricultural engineering.....	699
Agricultural economics.....	707
Rural sociology.....	717
Foods—human nutrition.....	718
Textiles and clothing.....	733
Home management and equipment.....	734
Miscellaneous.....	735
Notes.....	736

EXPERIMENT STATION RECORD

VOL. 72

MAY 1935

No. 5

EDITORIAL

RECENT PROGRESS IN THE COORDINATION OF AGRICULTURAL RESEARCH

One of the significant developments of recent months has been the appointment by the Secretary of Agriculture on March 22, 1935, of a Departmental Committee on Regional Economic Research and Agricultural Planning. This committee is headed by Mr. H. R. Tolley, Director of the Program Planning Division of the Agricultural Adjustment Administration, with Mr. J. T. Jardine, Chief of the Office of Experiment Stations, and Mr. Eric Englund, Assistant Chief of the Bureau of Agricultural Economics, as associate members and with Dr. C. W. Warburton as a representative of the Extension Service in the sessions of the committee. It was set up following a series of regional conferences with directors of the State experiment stations in order to organize and direct the program for the research there outlined and to "establish cooperative relationships with the States."

The appointment of this committee affords increasing evidence of the progress which is steadily being made in coordinating the agricultural research under way in this country. Elsewhere, however, the movement is also gaining ground. Thus from China a report has recently been received on the scope and work of the new National Agricultural Research Bureau. This bureau was organized as a division of the Ministry of Industries of the National Government of the Republic of China, following a recommendation of a committee appointed in 1931 and headed by a former Vice Minister of Industries and the director of the Metropolitan Museum of Natural History. It was the purpose of this committee to ensure that "all the agricultural work supported by national funds should be coordinated and centralized in this one organization, and that for all the agricultural research and extension there should be one coordinated program for the whole nation."

Various delays, occasioned in part by the Japanese occupation of Manchuria and the occurrence of the greatest flood in many years, caused the postponement of operations until 1933. At that time a definite allotment of \$300,000 was secured for initial expenses and

a monthly budget allowance of \$50,000. Hon. K. P. Chen was appointed director and Mr. T. H. Chien vice director. Major divisions were set up in agricultural economics, animal production, and crop production. The work in animal production was subdivided into departments of sericulture and animal husbandry and veterinary science and that in crop production into departments of agronomy, forestry, plant pathology and entomology, and soils and fertilizers. A technical staff was recruited, a tract of land of about 300 acres acquired outside of Nanking through the purchase and consolidation of over 2,300 small fields owned by about 700 farmers, a headquarters building for offices and laboratories erected for occupancy late in 1934, and other construction brought under way.

Much technical work has been undertaken by the bureau itself, using a project system, with endorsement of each project by the chief technician of the bureau, a position held in the initial stages by Dr. H. H. Love, then on leave of absence from Cornell University as adviser to the Ministry of Industries and head of the division of crop production. In many lines, however, there is direct cooperation with other institutions, including large regional tests of wheat, rice, and cotton varieties and their improvement. The report specifically states that "it is the hope that, as time goes on, the bureau will be able to work in close cooperation with all those agencies established to serve agriculture. The results of research work will be much more valuable if the projects can be conducted cooperatively with many different organizations. It is only through combined cooperative effort that the large nation-wide or regional problems can be solved, and it is hoped that as time goes on the bureau may take a lead in helping develop this cooperation."

Even more significant steps in coordination have been taken in Great Britain, and these have recently been authoritatively summarized in the first report of the Agricultural Research Council, which was set up there primarily as a coordinating agency. This report provides much first-hand information as to the progress which has been attained and contains some discussion of problems and policies.

It appears that in 1930 the Committee of the Privy Council for the Organisation and Development of Agricultural Research, consisting of a president and a secretary, the Minister of Agriculture and Fisheries, the Secretary of State for Home Affairs, the Secretary of State for Scotland, and the President of the Board of Education, was constituted by royal order. Following a recommendation of this committee the Agricultural Research Council was chartered on June 29, 1931. The report covers the period of the subsequent activities of the council to September 30, 1933.

The council is under the general direction of the committee, and in this respect corresponds to the Medical Research Council and the Department for Scientific and Industrial Research, which had been previously organized. These three allied bodies were designed to complete the scientific organization for the supervision of subsidized research in Great Britain, and they act in close collaboration, with certain members and officers in common.

The functions of the Agricultural Research Council itself are both administrative and advisory. It has control of relatively small grants from the development fund (£6,000 in 1933) for the initiation and encouragement of special researches, but its principal duty is to advise the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland, and the Development Commission on the scientific aspects of the agricultural work going on in research institutes and elsewhere at a total cost to the Government in 1931 of £390,000.

As at present constituted, the council consists of from 12 to 15 members, of whom not less than 4 nor more than 5 are selected on account of their general experience and interest in agriculture. The remainder are appointed after consultations with the head of the Royal Society because of their qualifications in a basic science underlying agriculture. Thus there are brought together a corps of specialists as well as others with an interest in agriculture as a whole.

Much of the council's work is handled through six subject matter committees, each headed by a council member as follows: Soils and plant nutrition, Sir Thomas H. Middleton; plant physiology, breeding, and disease, Sir A. Daniel Hall; animal diseases, Sir Merrik Burrell; animal nutrition and breeding, Sir Frederick G. Hopkins; dairying and animal products, Dr. E. P. Cathcart; and economics, Mr. Joseph F. Duncan. The membership of these committees is drawn from both the council and elsewhere, and there are also a large number of special committees, notably for specific animal diseases. These committees and subcommittees meet at irregular but rather frequent intervals, often in joint session, and the council itself about once in 3 months.

The initial task of the council was to examine the work already in progress. This was an undertaking which proved to be of considerable complexity and difficulty. When the council was established, it was expected that the research work in the various institutes would be gradually developed and increased under its leadership. Before it began its work, however, the financial crisis supervened, not only precluding additional expenditures but demanding savings wherever possible. Ultimately the termination in 1933 of the Empire Marketing Board necessitated many readjustments in projects financed by

that board. The survey itself is still under way, but a comprehensive report has been prepared which, in the words of a recent review in *Nature*, "forms a permanent and authoritative record of the progress and achievements of agricultural science up to 1933, and . . . illustrates in an exceptionally lucid manner the interconnection of the different branches to form a single science."

Thus far the formulation of definite recommendations has been largely deferred, but some conclusions as to duplication of work are set forth which are of general interest. The council reports a need of collaboration in some instances, but that the amount of wasteful overlapping in the work of the various research institutes is negligible. "Even when two institutes are investigating the same subject it is usually clear that they have approached it from different angles and are likely to help each other. Such a conjunction of enquiries is good and not evil."

The review in *Nature* expresses the view that "the establishment of a national research council marks the beginning of a new epoch in the history of British agricultural science." It is well known that the British system of agricultural research has developed with a very different background and circumstances from that in the United States, and there is no thought of analogies either there or in China or elsewhere as necessarily applicable to our own situation. Nevertheless, these reports are well worthy of study from various points of view, and further developments and progress along the lines indicated should have much of value for administrators and workers in agricultural science regardless of their geographical location.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Bacteriological and chemical investigations of the New York State Station] (*New York State Sta. Rpt. 1934*, pp. 20-23, 33-35, 39, 40).—The work reported for the past year has included sauerkraut investigations; studies of fruit juices (especially cider, grape juice, and apple juice concentrate), spoilage of tomato pulp, juice, and catsup and of salad dressing, canned peas, fermentation of plums, enzyme action at low temperatures, the chemistry of pectin and pectic enzymes, injury from calcium arsenate sprays, and influence of the halides of sodium and rubidium on proteins; and inspection of dairy glassware.

The proteins of grasses.—III, The cystine content of certain grasses and other pasture plant proteins, A. POLLARD and A. C. CHIBNALL (*Biochem. Jour.*, 28 (1934), No. 1, pp. 326-336).—In continuation of work previously reported (*E. S. R.*, 71, p. 147), the cystine content of several typical grass and other pasture plant proteins was determined by Prunty's modification of Sullivan's colorimetric method (*E. S. R.*, 70, p. 444). The grass proteins all contain cystine to an amount varying from 0.3 to 0.95 percent. Lucerne leaf protein was found to be particularly rich in cystine and to contain 1.2 percent. A gravimetric method gave in all cases a value for cystine sulfur much higher than that shown to be present, "and must include the sulfur of an unknown amino acid."

The protein-cystine content of the grasses and other pasture plants at various protein levels having been calculated, "it appears that pasturage contains ample cystine for the wool-protein requirements of the sheep which it normally carries."

Effect of ultra-violet radiation and heat upon protein solutions of low concentrations, M. SPIEGEL-ADOLF (*Biochem. Jour.*, 28 (1934), No. 1, pp. 372-379).—"Protein solutions of 0.1-0.2 percent, irradiated or heated in the presence of acid or alkali, show practically unchanged refraction. Electrolyte-free serum albumin and pseudoglobulin in concentrations from 0.2 to 0.002 percent are practically entirely coagulable by heat or irradiation; in the latter case, only the filtrate shows an increase in refraction and a positive reaction with colloidal gold. Protein solutions of 0.2-0.5 percent containing acid or alkali do not show, after irradiation, neutralization, and heat coagulation, positive reactions with colloidal gold." Filtrates of protein coagulated by heating or irradiation and concentrated 10-50 times gave results indicating the presence of atypical proteoses in the latter case. The proteoses appeared to be distinguished by strong light absorption. Their power to flocculate colloidal gold exceeded the power of genuine proteins 10-40 times. They also precipitated mastic sol.

Titration of protein with trichloroacetic acid, R. K. SCHOFIELD and L. W. SAMUEL (*Nature [London]*, 134 (1934), No. 3391, p. 665).—From preliminary

trials of trichloroacetic acid as a reagent for the titration of the amino groups of proteins, the authors of this contribution from the Rothamsted Experimental Station find that edestin added to a 0.1 M solution of this acid at the rate of about 1 g per 100 cc and centrifuged gives a clear liquid which contains only a trace of the added nitrogen and can be back-titrated to a sharp end point. Similar results were obtained with the mixed proteins of wheat flour.

"The acid binding capacity of edestin determined in this way is in good agreement with published figures. Trichloroacetic acid appears, therefore, to be a valuable reagent not only for the precipitation of protein, for which purpose its use in solutions of 10 percent and upward is already recognized, but also, when more dilute, for the rapid estimation of titratable amino groups. Ordinary meta (glacial) phosphoric acid is a mixture of a number of acids of general formula $(\text{HPO}_3)_n$, some of which are therefore polybasic. This introduces difficulties both in the back-titration and also in the interpretation of the results, so that this acid will probably prove to be less generally useful than trichloroacetic."

Dilatometric studies in the proteoclastic degradation of proteins.—I, Tryptic hydrolysis, M. SREENIVASAYA, B. N. SASTRI, and H. B. SREERANGACHAR (*Biochem. Jour.*, 28 (1934), No. 1, pp. 351–355, figs. 3).—The course of the tryptic digestion of caseinogen and gelatin was followed by means of a two-bulbed dilatometer "which enables the reaction to be investigated from its very commencement."

The early stages of the reaction, during the first 30 or 40 min., were accompanied by changes registered by the dilatometer but not indicated by the determinations of amino nitrogen. After this period, however, the dilatometric depression was proportional to the release of amino nitrogen in the case of both the proteins. "The abnormality occurring in the initial stages of the digestion is closely connected with the process of liquefaction, which generally precedes the rapid cleavage of proteins." The dilatometric depression per millimole release of amino nitrogen was found to be 8.7 mm in the case of gelatin and 10.8 in the case of caseinogen. "This constant appears to be a function of the structure and amino acid make-up of the protein."

The isolation of crystalline trypsinogen and its conversion into crystalline trypsin, M. KUNITZ and J. H. NORTHROP (*Science*, 80 (1934), No. 2083, pp. 505, 506).—The authors present a brief preliminary report upon the isolation in crystalline form of trypsinogen in the form of a protein crystallizing in short triangular prisms and possessing in itself no proteolytic activity but capable of activation either by the addition of enterokinase or by solution of the trypsinogen in concentrated magnesium sulfate or ammonium sulfate solutions. "Under the latter conditions [activation by either of the salts named] the activation is autocatalytic." It was further found that "on standing in concentrated magnesium sulfate solutions at pH 7.0–8.0 this protein is transformed into the active proteolytic enzyme, trypsin, which may then be crystallized in the form of short rectangular prisms or fine needles. . . . For this reason it has not been possible, so far, to recrystallize the trypsinogen, since the conditions for crystallization are also those for activation. The trypsinogen is, therefore, transformed to active trypsin before trypsinogen crystals can form, and the crystals which later appear are those of active trypsin instead of trypsinogen."

Crystalline trypsin is obtained when "trypsinogen crystals are washed with 0.5 saturated magnesium sulfate in 0.10 M borate buffer pH 8.0 and then with saturated magnesium sulfate in 0.1 M acetic acid. Ten g filter cake is suspended in 5 ml 0.01 M sulfuric acid and 2.5 M sulfuric acid added drop by

drop until the crystals dissolve. Ten ml saturated magnesium sulfate and 5 ml 0.4 M borate buffer pH 9.0 is added and pH adjusted with saturated potassium bicarbonate solution to pink to phenol red on test plate. The solution is inoculated and allowed to stand at about 5° C. A heavy crop of trypsin crystals forms in a few hours. The first crystals may be poorly defined. Recrystallization is carried out in the same way but with slightly more dilute solution of the protein. The crystals are needle shaped and may be quite short or may appear in rosettes."

Oxidation-reduction potentials and ferricyanide reducing activities in peptone cultures and suspensions of *Escherichia coli*, C. E. CLIFTON, J. P. CLEARY, and P. J. BEARD (*Jour. Bact.*, 28 (1934), No. 6, pp. 541-559, figs. 3).—A contribution from Stanford University describes apparatus for potential measurements in continuous flow cultures, and reports upon growth, oxidation-reduction potentials, and ferricyanide reduction, studied in stationary and continuous flow peptone cultures of *E. coli*.

"A marked fall in potential occurs during the period of rapid growth, and a maximum reduction potential is developed in or near the maximum stationary growth period. This potential and maximum viable count is maintained quite constant in continuous flow cultures. The concentrations of peptone, organisms, and ferricyanide play closely connected roles in controlling the metabolic activities of the cells, as measured by the rate of reduction of ferricyanide." Evidence which suggests that the oxidation-reduction potentials observed in bacterial cultures are a resultant of the metabolic activities of the cells is presented.

Oxidation-reduction potentials and ferricyanide reducing activities in glucose-peptone cultures and suspensions of *Escherichia coli*, C. E. CLIFTON and J. P. CLEARY (*Jour. Bact.*, 28 (1934), No. 6, pp. 561-569, figs. 2).—This further contribution reports that in the glucose-peptone cultures a more marked fall in potential occurred during the period of rapid growth, and a higher reducing intensity was established than in plain peptone cultures. A higher maximum viable population was also developed in the presence of glucose, and this maximum population was maintained under favorable conditions in continuous flow cultures.

"The concentrations and nature of the substrates and oxidants and the concentration of organisms play closely connected roles in controlling the metabolic activities of the cells, as measured by the rate of reduction of ferricyanide. Maltose, glucose, and lactose are readily oxidized by potassium ferricyanide in suspensions of 'resting' *E. coli*. These limited studies suggest that the ability of *coli* to utilize these sugars decreases as the E_h of the oxidant decreases."

Reactions of terpenes with antimony trichloride, V. E. LEVINE and E. RICHMAN (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2051-2054).—In studying the antimony trichloride reaction with members of the terpene group, two reaction mixtures were used—A, a mixture of 3 or 4 drops of a 20 percent solution of the terpene in chloroform with 2 cc of the Carr-Price antimony trichloride reagent and B, the same mixture with the addition of 0.5 cc of acetic anhydride to the terpene solution before the addition of the antimony trichloride solution.

The reaction is usually characterized by a succession of color changes, with purple as the predominant final color. The acetic anhydride prevents the formation of a precipitate in the reaction mixture, induces a more vigorous action, and leads to a more intense final color. "The terpenes that react most vigorously are the unsaturated ones, and the higher the degree of unsaturation the greater the reactivity of the compound. The presence of an aldehyde, alcohol,

or ketone group induces greater reactivity in the unsaturated compound. The camphane group is the least reactive and the olefine group the most reactive."

Some physico-chemical properties of lactose.—III, The aqueous vapor tension of alpha hydrate-anhydride systems. The preparation of alpha anhydride, B. L. HERRINGTON (*Jour. Dairy Sci.*, 17 (1934), No. 9, pp. 595-605, figs. 2).—Continuing this study (E. S. R., 72, p. 293), it was found that hydrated lactose lost its water of crystallization at temperatures as low as 80° C. when heated in an air oven, but that the rate of loss was very slow. The rate of loss was greater from small crystals than from large ones. On the other hand, size of crystal was of little importance in determining the rate at which moisture was taken up by the anhydride.

Measurements of the vapor pressure of the system of alpha hydrate-anhydride were made at temperatures between 50° and 100°. The results showed that some reaction other than the loss of water of hydration occurred on continued heating of lactose. The loss of water was considered to be a relatively rapid process, while the unknown reaction was very much slower.

Purification of vitamins: Fractional distribution between immiscible solvents, R. E. CORNISH, R. C. ARCHIBALD, E. A. MURPHY, and H. M. EVANS (*Indus. and Engin. Chem.*, 26 (1934), No. 4, pp. 397-406, figs. 7).—A special machine, the essential parts of which are illustrated by diagrammatic drawings, has been constructed "which permits a remarkable if not complete purification of the fat-soluble vitamins A, D, and E by fractional distribution between immiscible solvents. At the same time, the machine provides an accurate method for measuring the distribution ratios of the absolutely pure vitamins without its being necessary to isolate them as pure substances."

This paper discusses the theory of the operation and construction of the fractionating column and the choice and preparation of the solvents, and presents data on the distribution ratios of vitamins A, D, E, and F (linoleic acid) and on the estimated distribution ratios of vitamin A at various temperatures. "It is proved beyond doubt that vitamin A exists in at least three distinct chemical forms, although the complete therapeutic effect is obtainable from any one of the three. Again, the therapeutic effect of vitamin D seems to be produced by a single substance, or at most by a mixture of substances each having nearly the same distribution ratio as the other. With these same qualifications, vitamin E is also proved to be a single chemical substance."

Absorption spectra in relation to the constituents of fish oils, J. R. EDISBURY, R. A. MORTON, and J. A. LOVERN (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1451-1460, fig. 1).—Data on the spectral absorption of the total acids from a number of fish-liver and fish-body oils are reported and discussed with reference also to earlier studies (E. S. R., 65, p. 805; 68, p. 724) concerned with the absorption spectra of vitamin A and its derivatives. The authors' conclusions are as follows:

"The well-defined narrow absorption bands owe their origin to unsaturation in the absorbing molecules. The highly absorbing acids are not present in the original oils as the corresponding glycerides. The hypothesis that the absorbing acids are straight chain compounds with conjugated double bonds is not in harmony with the evidence. A change, unsaturated acids (low absorption)→unsaturated acids (high and selective absorption), occurs during saponification. Cyclization is the most plausible explanation of this change."

The colorimetric determination of vitamin A by the alkali digestion method, A. W. DAVIES (*Biochem. Jour.*, 27 (1933), No. 6, pp. 1770-1774).—This paper describes the method which has been adopted for rapid routine work in

the examination of autopsy specimens of human liver for vitamin A content, and discusses the precautions which must be taken to avoid losses of the vitamin. The method makes use of a modification of the alkali digestion process described by Rosenheim and Webster (E. S. R., 57, p. 391) and later used on autopsy material by Moore (E. S. R., 68, p. 706).

Irradiated adenine sulphate as a source of vitamin B₁ for growth, B. SURE (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2043-2046).—Attempts to synthesize vitamin B₁ by ultraviolet irradiation of adenine sulfate, as announced in a preliminary communication from Guha and Chakravorty (E. S. R., 68, p. 725), are reported with entirely negative results. "Pure adenine sulfate, irradiated for periods ranging from 1 to 30 min. and fed in doses of 0.1 to 1 mg per rat daily proved to be a complete failure as a source of vitamin B₁ for growth."

The heat-stability of vitamin B₂.—III, The rate of destruction at various reactions of vitamin B₂ contained in different materials, M. H. ROSCOE (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1540-1544).—Conflicting results reported in the literature concerning the heat stability of vitamin B₂ are reviewed briefly, particularly the report of Guha (E. S. R., 67, p. 188) leading to the conclusion that variations in the source of the vitamin may affect its stability. A reinvestigation of the question is reported in which the materials used by Guha (a watery yeast extract, a watery liver extract, and marmite) were used. An extension of an earlier series of experiments on the heat stability of vitamin B₂ yeast extracts as affected by variations in pH and time of heating (E. S. R., 64, p. 589), is also reported.

"No difference was found in the stability to heat and weak alkali of vitamin B₂ as contained in (1) a watery yeast extract, (2) marmite solution, or (3) a watery liver extract (Eli Lilly, No. 343). When heated for 1 hr. at 120° at pH 8.7-7.2 all three materials lost 50 percent of their original vitamin B₂ potency. Thus no support was obtained for the theory that the resistance of vitamin B₂ to heat and alkali varies according to the material in which it is present. In confirmation of previous work, vitamin B₂ was found to be relatively heat-stable in acid solution and the rate of destruction to be increased rapidly with increasing alkalinity."

The constitution of the vitamin osazone [trans. title], K. TATEMATSU, K. NOGI, and A. YONEDA (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 225 (1934), No. 5-6, pp. 275-278).—This paper discusses the chemical nature and probable structure of the osazone of vitamin C noted on page 732. The osazone is thought to have a pyrazolone instead of a lactone ring. The red color of the osazone fades in 50 percent acetic acid on the addition of zinc powder. The solution shows a violet red color after treatment with sodium hydroxide to an only slightly acid reaction. On further addition of sodium hydroxide the color turns to violet, and after heating to yellow. The osazone test is thought to offer promise as a means of detecting vitamin C.

Color reactions for vitamin C [trans. title], N. BEZSSONOFF and A. DELIRE (*Compt. Rend. Acad. Sci. [Paris]*, 196 (1933), No. 26, pp. 2036-2038, fig. 1).—Data are presented pointing to the nonspecificity of the 2,6-dichlorophenolindophenol test for vitamin C.

A color test for vitamin C, J. H. ROE (*Science*, 80 (1934), No. 2085, p. 561).—It is noted briefly that when ascorbic acid is boiled with hydrochloric acid carbon dioxide is evolved, the molecule apparently loses water, and furfural is formed, which may be detected by the use of the aniline, phloroglucinol, or orcinol tests. The test with aniline, the development of a pink color in a solution of ascorbic acid after boiling with hydrochloric acid and treatment

with aniline to pH 5 or 6, is said to be quantitative, although pentoses, pentosans, hexoses, and hexosans are interfering substances.

The influence of vitamin C on intracellular enzyme action, A. PURR (*Biochem. Jour.*, 27 (1933), No. 5, pp. 1703-1705).—Two examples are given showing the influence of ascorbic acid on intracellular enzyme action. One involved the activation of arginase in the incubation of a glycerol-liver suspension with arginine carbonate with a glycine buffer and the other the decomposition of a carcinoma-glycerol suspension in gelatin. In the former the addition of crystalline ascorbic acid in suitable concentration produced nearly as much increase in arginase activity as did the same quantity of cysteine HCl with 0.5 cc of N/10 FeSO₄, while the ascorbic acid and the iron solution produced a greater increase in arginase action. In the second illustration, the ascorbic acid brought about nearly as great an increase in NH₂ as did the same amount of cysteine.

Isolation of vitamin C from vegetables and the relations between vitamin C and ascorbic acid, S. MARUYAMA (*Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers*, 24 (1934), No. 518, pp. 287-303, pls. 2, fig. 1).—Using a slight modification of the Szent-Györgyi method of isolating ascorbic acid from natural sources, the author has obtained crystals from the suprarenal cortex of the ox, the juice of the Japanese radish (Daikon, *Rhapanus sativus*), the juice of a kind of Japanese lemon known as Natumikan (*Citrus aurantium*), and Japanese green tea. The analytical values, specific rotation, and chemical and physical properties of the crystals prepared from the various materials were those of pure ascorbic acid. The purified crystals from the first two materials proved effective in doses of 0.8 mg in curative tests on guinea pigs. Microphotographs are given of the crystals isolated from each of the materials.

Standardisation of the antiscorbutic potency of ascorbic acid, L. J. HARRIS and S. N. RAY (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2016-2021, fig. 1).—A repetition of an earlier study (E. S. R., 70, p. 741) of the antiscorbutic potency of ascorbic acid in comparison with orange juice is reported, with the same results. Two mg of the ascorbic acid was equivalent to 3 cc of orange juice, with these amounts constituting the minimum dosage for complete tooth protection in guinea pigs according to the tooth structure method, as previously described (E. S. R., 69, p. 904). The calculated ascorbic acid value of the orange juice is thus 0.66 mg per cubic centimeter. The average value of 14 samples of orange juice, as determined by titration, was almost the same, 0.63 mg per cubic centimeter.

Titration values for the juices from 20 lemons of varying size and condition gave an average ascorbic acid content of 0.47 mg per cubic centimeter, and the same value was obtained for a composite sample of the mixed juice of 10 lemons. Greater variations were found in the individual samples of lemon juice than of orange juice, the ascorbic acid content varying from 0.19 to 0.69 mg per cubic centimeter.

The data are discussed with reference to the use of lemon juice as the international standard, with the conclusion that it is unreliable and should be replaced by ascorbic acid.

The chemistry of vitamin D [trans. title], G. WEIDLICH (*Ztschr. Vitaminforsch.*, 2 (1933), No. 4, pp. 253-266).—This review of recent literature contains an extensive classified bibliography.

The difference between synthetic and naturally occurring vitamin D with respect to physical and chemical properties [trans. title], F. ENDER (*Ztschr. Vitaminforsch.*, 2 (1933), No. 4, pp. 241-249, figs. 3; Fr., *Eng. abs.*, pp.

248, 249).—A concentrate prepared from the unsaponifiable fraction of tuna fish-liver oil was found to have the characteristic vitamin A absorption band of 328 m μ , but not the band at 265 m μ considered to be characteristic of synthetic vitamin D (calciferol). The concentrate, however, was effective as an antirachitic agent for rats in doses of from 0.25 to 0.5 γ daily. It reacted at room temperature with phthalic anhydride, whereas synthetic vitamin D reacts very slowly with this reagent at room temperature.

These differences are thought to indicate the nonidentity of synthetic vitamin D and vitamin D as present in liver oils.

Critical study of Shear's aniline-hydrochloric acid reaction associated with vitamin D, I, II (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2047–2050).—Two papers are presented.

I. *Furan and derivatives*, V. E. Levine and C. L. Seaman (pp. 2047–2048).—This brief paper reports color reactions of furan and derivatives with the Shear aniline hydrochloric acid reagent (*E. S. R.*, 56, p. 203). Colors obtained in the cold varied from red, lavender, purple, and green to blue. Several substances failed to develop a color in the cold, but developed a deep red or brown-red color on heating. Some compounds containing the pyrrole ring did not react either in the cold or on heating. Color reactions with various carbonates are also noted.

II. *Terpenes*, V. E. Levine and E. J. Shaughnessy (pp. 2048–2050).—Color tests with the same reagent are tabulated for various terpenes and related compounds. The results do not confirm the conclusion of Sexton (*E. S. R.*, 60, p. 792) that the ketone group is responsible for the color reaction. It is noted that the aniline hydrochloric acid reagent also gives color tests with carotene and with substances containing any of the fat-soluble vitamins. Its specificity for vitamin D, as suggested by Shear, is thus disproved.

The ring-system of sterols and bile acids.—V, On the constitution of ergosterol and its irradiation products, O. ROSENHEIM and H. KING (*Jour. Soc. Chem. Indus., Chem. and Indus.*, 53 (1934), No. 9, pp. 196–200, fig. 1).—A constitutional formula for ergosterol is proposed in the belief that "it not only offers a rational explanation of those experimental data which seem to be well established, but has the additional advantage of supplying a much needed working hypothesis for formulating in orderly sequence the series of intramolecular changes underlying the conversion of ergosterol into the vitamin." The formula is discussed from the standpoint of (1) position of the nuclear double bonds, (2) position of the hydroxyl group, and (3) irradiation products. The sequence of events in the activation process through irradiation—ergosterol→lumisterol→protachysterol→tachysterol→calciferol—is shown graphically.

"According to the above conceptions, three types of intramolecular change take place under the influence of ultraviolet rays when ergosterol is converted into vitamin D: (1) Epimerization of the hydroxyl group; (2) movement of the system of conjugated double bonds in three distinct stages from ring II into ring IV, involving (3) a steric change in the ring system leading from the allocholane to the cholane structure. This scheme, arising from what is admittedly a working hypothesis, suggests experimental work in various directions, such as a synthesis of simple cyclic systems containing a cyclopentadiene ring, which might be expected to possess some antirachitic activity."

Apple juice concentrate, D. C. CARPENTER and E. C. SMITH (*Indus. and Engin. Chem.*, 26 (1934), No. 4, pp. 449–454, figs. 2).—Apple juice has been concentrated at the New York State Experiment Station without losing its characteristic aroma and flavor by the use of a commercial fruit concentrator equipped

with a device for returning the volatile esters to the concentrated juice. The apparatus is described and illustrated, and data are reported on the recovery of the esters and on the physical and chemical constants of the concentrates prepared from Rome Beauty, Russet, and Northern Spy apples. The concentrate can be used either for reconstitution with water to the consistency of the fresh juice or for making carbonated beverages. For the latter purpose the concentrate promises to be more practical than the clear unconcentrated juice described previously (E. S. R., 68, p. 443), on account of the fact that it is the usual custom in making carbonated beverages to place in the bottle a small amount of a concentrate or sirup containing the desired flavoring material and fill the remainder of the bottle with carbonated water. It is thought that the concentrate can be handled by bottlers with little or no change in operations or equipment.

AGRICULTURAL METEOROLOGY

Bioclimate as local climate (kleinklima) and microclimate [trans. title], W. SCHMIDT (*Bioklim. Beibl. Met. Ztschr.*, 1 (1934), No. 1, pp. 3-6).—The author states that for plant and animal life the lower air strata, with their local effects, are of the greatest importance. To meet the demands of the biologist, methods must be followed which differ in many ways from those employed in general climatology, in that local conditions are studied more closely and minutely, either by using the generally established methods of observation but evaluating the acquired data on the basis of the "local climate" concept, or by employing refined apparatus for observations to determine clearly the factors involved. In this way meteorology will be closely connected with plant ecology in the widest sense, and the possibility of acquiring more complete climatic knowledge will be enhanced.

Climate and soil microbiology [trans. title], A. VON SZILVINYI (*Bioklim. Beibl. Met. Ztschr.*, 1 (1934), No. 1, pp. 29-32).—The author discusses the sensitiveness of certain soil bacteria and fungi to climatic factors, and argues for the study of the microflora of the soil to determine species which may be used as indicators of particular climatic conditions.

The connection between radiation and duration of sunshine [trans. title], A. ÅNGSTRÖM (*Bioklim. Beibl. Met. Ztschr.*, 1 (1934), No. 1, pp. 6-10, figs. 2).—The relation between total radiation from sun and sky and duration of sunshine is discussed in the light of newly acquired material. The results indicate, in general, the possibility that even simple records of duration of sunshine give important quantitative results regarding the total radiation of sun and sky, which seem to be generally of sufficient accuracy to serve as a basis for calculating the correlation between radiation and biological factors at a particular point. From a climatological and climato-biological standpoint it is recommended that detailed studies of the connection between radiation and duration of sunshine be made at definite special observatories, but that in larger climatological areas simple apparatus comprising uniformly constructed and operated sunshine recorders be used. Close cooperation between the central observatories and the more simple climatological stations is important.

Influence of wind on the concentration of carbon dioxide in the air [trans. title], D. SZYMKEWICZ (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest Ann.)*, 33 (1934), pp. 13-22, fig. 1; *Fr. abs.*, pp. 19-22).—It is shown that wind movement has a determining influence on the proportion of carbon dioxide in the air, and that this influence varies with different times of the day and

velocity of the wind. Other factors which influence the concentration are respiration and decomposition of organic matter. The tendency, however, as a resultant of the different factors is for the proportion to become constant.

Fixation by plants of radium emanations from the soil [trans. title], A. LEPAPE and R. TRANNOY (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 17, pp. 803-805; *abs. in Rev. Sci. [Paris]*, 73 (1935), No. 1, p. 29).—The addition of small amounts of radium to the soil appeared to exercise practically no influence on plants cultivated on the soil. Radium naturally present in the soil appeared to be assimilated by plants in amounts varying with radio-activity of the soil. The radium content of corn was highest in the leaves and lowest in the grain.

Long-range weather forecasting (*Science*, 80 (1934), No. 2083, Sup., p. 15).—Brief reference is made to studies by Charles F. Brooks and Ernest M. Harwood, of the Blue Hill Meteorological Observatory, of the possible use of ocean temperatures in conjunction with other factors in forecasting air temperatures and precipitation along the Middle and North Atlantic seaboard.

“‘It seems possible’, says Dr. Brooks, ‘that the coastal waters may give indications of the air-temperatures of the following month along the Middle and North Atlantic seaboard, low sea-temperatures being followed by high air-temperatures, and vice versa. Furthermore, it seems likely that the precipitation stands in inverse relationship to the general sea-temperature of the preceding month.’”

While the sequences of departures of weather and sea temperatures observed during a 5-yr. period did not show any striking opposition, an inverse relationship did predominate rather consistently.

Meteorological report for 1933, F. E. HEPNER (*Wyoming Sta. Rpt. 1934*, pp. 50-53).—The usual summaries of observations on pressure, temperature, precipitation, wind, and sunshine at the University of Wyoming at Laramie are given, with comments on some of the more significant features of the weather of 1933. The year was characterized by continuous warm, dry weather. The mean temperature was 43.8° F., 3° above normal. The total precipitation, 5.8 in., was the lowest since 1893.

SOILS—FERTILIZERS

[Soil work at the California Station] (*California Sta. [Bien.] Rpt. 1933-34*, pp. 18-22).—This has included work on a rating of the agricultural value of soils, on the reclaiming of alkali lands, on the relation of water to soil, observations of the subsidence of peat lands, the effect of adding organic material to the soil, and the adequacy of the supply of phosphates in southern California soils.

[Chemical and bacteriological soil investigations of the New York State Station] (*New York State Sta. Rpt. 1934*, pp. 14, 60, 61).—The present report contains notes on bacteria that help retain nitrogen in the soil, tests for nutrient deficiencies in soil by means of a bacterial species distinct from *Azotobacter*, lysimeters in the study of fundamental soil relations, studies of tree responses by lysimeter methods, and further studies of unproductive soil types of New York.

[Soil fertility work of the West Virginia Station] (*West Virginia Sta. Bul. 263* (1934) pp. 16, 17, 19).—Under the general head of the maintenance of soil fertility the report presents findings as to residual reaction of fertilizers, and effects of subsoiling.

A chemical study of a soil under long-continued field experiments, H. J. SNIDER (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 946-953).—The application to Cisne silt loam, over a period of about 15 yr., of a total of 7,000 lb. of superphosphate, 14,000 lb. of rock phosphate, or 5,250 lb. of basic slag left a residue in the surface soil of from 300 to 350 lb. per acre of total phosphorus in the case of the superphosphate treatments, about 1,500 lb. in the case of the rock phosphate, and about 350 lb. in that of the basic slag. The phosphorus applied to the soil in the form of rock phosphate had at the end of a 27-yr. period a much higher solubility than that added as superphosphate or basic slag phosphate. The penetration of applied phosphorus into the subsurface soil was practically negligible on the soil under consideration. Eight tons of lime increased the solubility of the native phosphorus in the soil, while 3 tons of limestone applied over a relatively short period of years had but little effect on the solubility of the native phosphorus. The Neubauer values indicated that the 8 tons of lime depressed the availability of rock phosphate and increased the availability of superphosphate and slag phosphate.

"This soil was low in replaceable potassium, and the Neubauer method showed it to be low in available potassium, although it is relatively high in total potassium. The 8 tons of lime depressed the availability of potassium as determined by the Neubauer method, and tended to give lower values for replaceable potassium as determined by the chemical method.

"The reaction of the untreated soil was pH 5.0. The soil to which 8 tons of lime were added had a pH ranging from 6.3 to 7.0, and where 3 tons of lime had been applied the pH ranged from 5.9 to 6.3. The various phosphates caused some variation in soil reaction. The lime applications increased the replaceable calcium values. The heavy lime treatment showed little, if any, increase in replaceable magnesium, while light lime maintained the replaceable magnesium values considerably above that of the untreated check. The total nitrogen and organic matter values were maintained at a slightly higher level on the soils with the light application of lime as compared with the heavy application.

"The wheat grain yields and the total phosphorus content of the grain from the unphosphated plats coincided with the phosphorus solubility values of the soils from these plats. The phosphorus content of the second year spring growth of sweetclover indicated that the heavy liming apparently aided the assimilation of phosphorus from superphosphate and basic slag and tended to depress the assimilation of phosphorus from rock phosphate."

Soil survey of Rockbridge County, Virginia, R. C. JURNAY ET AL. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 4, pp. 42, figs. 2, map 1*).—In this report, prepared with the cooperation of the Virginia Experiment Station, Rockbridge County is described as an area of 394,240 acres having a surface relief "which ranges from undulating, smooth, and gently rolling to strongly rolling, steep, and hilly in the valley and to steep, sharp, broken, and rugged in the mountains", and drainage conditions ranging from those of small, ill-drained places in the bottoms and terraces through the normal drainage of much of the valley portion of the county to the excessive drainage of the steeper areas and mountainous sections.

The soils of this county were found to constitute 15 series, inclusive of 28 types, of which Muskingum stony fine sandy loam (7.1 percent) and its extensive steep phase (18.4 percent) occupies 25.5 percent of the county, Frederick silt loam following with 14.9 percent. Although 0.4 percent of rock outcrop is the only material listed unclassified, it is noted that "about 37 percent

of the total area is included in rough mountain land and Government forest reservations."

Measuring soil fertility, A. W. BLAIR (*New Jersey Stas. Circ. 335 (1934), pp. 4*).—This is a brief popular summary of the more obvious physical, chemical, and biological factors involved in soil fertility.

Obtaining uniform maturity with soil tests, R. H. BRAY (*Canning Age, 15 (1934), No. 11, pp. 483-485, 503, figs. 2*).—The soil test as a means for the selection of land for the production of canning crops is discussed in a contribution from the Illinois Experiment Station.

The selection and treatment of the land for quality, yield, and uniform maturity throughout the field has been based to a large extent on the tests for acidity and phosphorus. Recently the potash test has been included. "The results, as shown by the records of yields from the tested lands, have been very satisfactory." It is further pointed out that "this type of work may be done by the canners' field man, and the requirements of special canning crops can be given special study in the areas in which they are being grown, through the use of the soil tests."

Soil bacteria that conserve nitrogen, I. H. J. CONN (*Farm Res. [New York State Sta.], 1 (1935) No. 2, p. 8, fig. 1*).—This is an introductory discussion, outlining the nitrogen cycle as usually described, but pointing out also the probable importance of the numerically much more abundant organisms, some of which act as nitrogen-retaining organisms, by converting soluble nitrogen compounds, which without this intervention would be leached out of the soil, into temporarily insoluble forms.

Movement of sulphate of ammonia when added as a fertilizer to soils, D. L. SAHASRABUDDHE and D. H. GOKHALE (*Indian Jour. Agr. Sci., 4 (1934), No. 1, pp. 121-146, figs. 5*).—In a soil containing moisture equal to 25 percent of the water-holding capacity of the soils, sulfate of ammonia diffused only through a distance of 3 in. in 6 weeks. With water equal to 50 percent of the water-holding capacity, the diffusion rate rose to 6 in., but the quantity diffused beyond 3 in. was small. Even with water equal to 75 percent of the water-holding capacity the diffusion did not go beyond 6 in. in 6 weeks, although the quantity diffused was much greater than that produced by a water content equal to 50 percent of the water-holding capacity. The distance through which sulfate of ammonia diffuses was the same for the horizontal, vertically downward, and vertically upward directions; but the quantities diffused were greater in the downward direction, and smaller in the upward direction, than those along the horizontal direction. "With a free surface of soil for evaporation the uppermost part gets dry, and the salt which is pulled up stops where capillary connection is broken either due to formation of hard layer or loose dry layer separated from the lower layer."

During diffusion a part of the ammoniacal nitrogen was changed into nitric nitrogen, the quantity changed increasing with the increase of water in the soil. Nitrogen in the form of nitrates was found to be more easily diffused than nitrogen in other forms.

In field trials with *Andropogon sorghum* ("rabi jowar"), ammonium sulfate placed within 3 in. of the plants was well utilized, that placed 6 in. from the plants was largely not utilized, and when the salt was placed more than 6 in. from the plants it was not available to them.

Soil factors which prevent toxicity of calcium cyanamide, D. S. FRINK (*Jour. Amer. Soc. Agron., 26 (1934), No. 11, pp. 929-939, figs. 2*).—The experiments reported upon in this contribution from the Wisconsin Experiment

Station were carried out, in general, by treating 100 g of soil with 10 mg of nitrogen in the form of Cyanamid and determining the remaining cyanamide ion after various periods of holding the mixtures at temperature and moisture conditions considered to be the optimum for the decomposition of the Cyanamid.

"Removal of cyanamide from the soil solution is brought about largely by physical processes that may be referred to as adsorption.

"Cyanamide disappears rapidly from the soil solution in the case of Miami, Carrington, Knox, and Marshall silt loams and probably all other soils having a fair amount of organic matter or a high amount of free iron oxides, and with all of these soils Cyanamid may be safely used with a less than normal period of time intervening between application and seeding. However, with soil types like Colby and Vesper silt loams, or Plainfield sand, the recommendation of allowing 3 days for each 100 lb. of Cyanamid used per acre before seeding is done should be closely adhered to because of the slowness of removal of cyanamide from solution in these cases.

"In normal soils, organic matter is apparently the chief adsorbent. Organic matter with a high base-exchange capacity seems to be a more active adsorbent than is organic matter with a low capacity. The state of saturation of organic base-exchange material with respect to cations apparently does not markedly affect its adsorptive power for cyanamide. Cyanamide disappears from the soil solution more rapidly in the more acid soil of a given soil type. It is shown, however, that this effect of reaction is insignificant in comparison to other soil factors, especially organic matter content. With soils low in organic matter but with a large amount of free iron oxide, cyanamide is removed from solution very rapidly.

"Activated charcoal was found to be a very strong adsorbent of cyanamide. The addition of iron oxide to activated charcoal produced a still stronger adsorbent. Cyanamide adsorbed by activated charcoal is transformed to urea in time. Cyanamide once adsorbed by activated charcoal cannot be removed easily through leaching except as urea is formed. Seeds germinated normally, and 100 percent in mixtures of 100 g of sand treated with 7.4 percent activated charcoal and 10 mg of Cyanamid nitrogen, whereas no germination took place in the absence of charcoal. When the activated charcoal was mixed directly with the same amount of Cyanamid and the mixture added to the sand, it required a weight of charcoal equal to that of the Cyanamid itself to prevent toxicity and allow 100 percent germination."

Commercial fertilizers report for 1934, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 365 (1934), pp. 58+IX*).—This is the usual report of fertilizer analyses, including inspection data for the year 1934.

Commercial fertilizers, 1934, J. M. BARTLETT (*Maine Sta. Off. Insp. 153 (1934), pp. 77-108*).—In addition to the determinations hitherto customary in fertilizer inspection analyses, determinations of magnesium were made in the cases of samples guaranteed as containing that element.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1934, C. S. CATHCART (*New Jersey Stas. Bul. 578 (1934), pp. 31*).—This bulletin contains the major part of the fertilizer inspection analysis data for 1934.

Commercial fertilizers in 1933-34, G. S. FRAPS and S. E. ASBURY (*Texas Sta. Bul. 498 (1934), pp. 52*).—This bulletin contains the usual analytical data for the 1933-34 season, together with other statistics concerning fertilizers sold in the State.

AGRICULTURAL BOTANY

[Papers presented before the physiological section of the Botanical Society of America, Pittsburgh, Pa., December 27-29, 1934] (*Amer. Jour. Bot.*, 21 (1934), No. 10, pp. 703-713).—Among the papers abstracted are the following: Further Study on "Frenching" in Orange Trees, by G. C. Wickwire and W. E. Burge (pp. 703, 704); Sand Culture of Seedlings as Compared with Soil Culture, by A. A. Dunlap (p. 704); Differential Distribution of Auxin in the Growing Leaf of Tobacco, by G. S. Avery, Jr. (p. 704); Further Studies on the Effect of Ultra-Violet Radiation on Seedlings, by H. W. Popp and F. Brown (p. 705); Glutathione and Sulphate in the Potato Tuber, by J. D. Guthrie (p. 705); Partial Inhibition of Photosynthesis and Reduction of Growth of Plants and Suppression of Remote Ancestral Characters Removed by Hybridizing with Remotely Related Species, by W. T. Swingle (p. 706); The Physiological Reactions of Forage Crops Under the Various Methods of Field Curing, by T. N. Jones and L. O. Palmer (p. 707); The Present Status of the Plasmodesmata Problem, by L. G. Livingston and I. W. Bailey (pp. 707, 708); A Simple Apparatus for the Laboratory Demonstration of Photosynthetic and Respiratory Ratios, by B. S. Meyer and D. S. Rader (p. 708); Yarovization of Winter Barleys, by D. N. Borodin (p. 708); Diurnal Fluctuation and Water Deficit Shrinkage in Thickness of Pineapple Leaves, by M. B. Linford (pp. 708, 709); The Experimental Production and Physiological Characteristics of Hermaphrodite and Monoecious Plants in Certain Normally Dioecious Species, by W. F. Loehwing (p. 709); The Action of Pectic Solvents Upon Cotton Fibers, by W. K. Farr (pp. 709, 710); The Effect of Reduced Oxygen Supply on the Germination of Cocklebur Seed, by N. C. Thornton (p. 710); Fluorescence in M-Ray Research, by D. M. Borodin (pp. 710, 711); The Effects of High Temperatures on Seeds, by L. E. Fox (p. 711); and Automatic Registration of the Desiccation of Leaves, by S. Prát (pp. 711, 712).

A quarter century of research activity in the department of plant physiology, R. B. ESPINO (*Philippine Agr.*, 23 (1934), No. 5, pp. 403-415, figs. 2).—This is a review of the accomplishments of this division of the College of Agriculture of the University of the Philippines in the study of plant ecology and acclimatization, plant morphology and anatomy, seed germination, water requirements, photosynthesis and influence of light on growth, salts and fertilizer requirements, and other subjects.

A new photometer adapted to botanical purposes [trans. title], O. H. VOLK (*Ber. Deut. Bot. Gesell.*, 52 (1934), No. 4, pp. 195-202, figs. 2).—This instrument, calibrated in luxes, is convenient for ecological photometry, but on account of the fact that the photoelectric cell is selectively sensitive for certain regions of the spectrum, comparisons with values determined by other methods cannot be made without allowing for the inherent differences in this respect. The author discusses his experiences with the instrument, which indicate the importance of light intensity as a factor in grape culture and in plant distribution.

A three-wire thermocouple system for use in cryoscopic investigations, E. M. HERRICK (*Amer. Jour. Bot.*, 21 (1934), No. 10, pp. 673-687, figs. 2).—This paper describes the construction of the system and discusses its use on living plant tissues in comparison with other systems.

General knowledge regarding plant nuclei.—I, The resting nucleus, G. TISCHLER (*Handbuch der Pflanzenanatomie*, edited by K. LINSBAUER. I. Abt., 1 Teil. II, Allgemeine Pflanzenkaryologie. I. Hälfte: Der Ruhekerne. Berlin:

Borntraeger Bros., 1934, 2. ed., pp. XX+630, figs. 252).—This is a revision of the 1921–22 edition, which has been brought down to date by the inclusion of recent literature. The extent of the contributions on which this comprehensive work rests may be judged by the fact that 130 pages are devoted exclusively to literature citations.

Different methods of cell wall thickening in vascular plants [trans. title], A. DAUPHINÉ (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 11, pp. 1064–1066*).—Two distinct methods of thickening are described. In the first, characteristic of parenchyma and collenchyma especially, the middle lamella increases in volume as the cells grow and pushes the thin cellulose layer toward the center of the cell. In the second, which occurs in cells that attain their full size without appreciable wall thickening, the subsequent thickening is brought about by the deposition of cellulose layers on the internal surface of the wall.

Ontogeny of phloem in the sugar beet (*Beta vulgaris* L.), K. ESAU (*Amer. Jour. Bot., 21 (1934), No. 10, pp. 632–644, figs. 27*).—This contribution from the California Experiment Station at Davis describes the origin, development, and fate of sieve tubes and associated tissues in the sugar beet leaf. In the sieve tube, as differentiation proceeds, “plastids and slime bodies develop, the nucleus and slime bodies disintegrate, the walls thicken, and the cytoplasm decreases in amount. Meanwhile, sieve plates develop, definitive callus is formed, and finally the sieve tube is crushed by phloem parenchyma cells in the process of obliteration. The companion cell has dense cytoplasm, a prominent nucleus, and chloroplasts. It is closely associated with the sieve tube, inasmuch as both are derived from the same mother cell, occur always side by side, and are obliterated at the same time. Cells of the phloem parenchyma are . . . little specialized. By renewed meristematic activity they may function in cambium initiation, or by simple division they may add to the phloem or bundle cap tissue. Their enlargement helps to obliterate sieve tubes and companion cells.

“Cambial activity is initiated in very young leaves and continues throughout the growth period. Obliteration of sieve tubes and companion cells also starts early and continues while new phloem elements are formed.”

Translocation of solutes in plants, H. F. CLEMENTS (*Northwest Sci., 8 (1934), No. 4, pp. 9–21*).—The author discusses critically various explanations proposed by different workers as to the movement of inorganic solutes and the movement of carbohydrates, organic nitrogen compounds, and fats and oils in plants; the mechanism of such translocation; and the tissues involved.

The drift of the content of potassium and calcium with age in plants, A. H. K. PETRIE (*Aust. Jour. Expt. Biol. and Med. Sci., 12 (1934), No. 3, pp. 99–110, fig. 1*).—Liquid expressed at 0.5 atmosphere per square inch from samples of perennial ryegrass (*Lolium perenne*) taken periodically from July to December was analyzed. The plants were grown in pots in the greenhouse. The absolute amount of K rose to a maximum at maturity or during late senescence and then declined until death, and that of Ca rose until late senescence and then underwent no appreciable decline.

Relation of oxygen pressure and temperature to the influence of ethylene on carbon dioxide production and on shoot elongation in very young wheat seedlings, W. B. MACK and B. E. LIVINGSTON (*Bot. Gaz., 94 (1933), No. 4, pp. 625–687, figs. 5*).—The results of this cooperative work between the Pennsylvania Experiment Station and Johns Hopkins University point out the fact that many conditions or factors are influential in determining physiological effects, including those produced by ethylene.

On the suction force in broad-leaved woody plants [trans. title], P. E. REGLI (*Bot. Centbl., Beihefte*, 51 (1933), 1. Abt., No. 3, pp. 541-618).—The "lever" and simplified methods of A. Ursprung and G. Blum were used to determine the suction tensions of pieces of plant tissue. Younger leaves, in general, showed lower suction tension than older ones. The higher above the ground the leaves were attached, the higher was their suction tension. This increased 1.17 atmospheres per meter for *Fraxinus excelsior*, 0.32 for *Pyrus communis*, and 0.76 for *Sambucus nigra*. The leaves frequently had higher suction tension than the flower petals on the same plant. The influence of external factors (soil and air temperature, saturation deficit of air, evaporation, exposure, wind, etc.) and the diurnal trend of suction tension are described. About 75 species were used in the research.—(*Courtesy Biol. Abs.*)

Further studies on the relation between thermal emissivity and plant temperatures, A. N. WATSON (*Amer. Jour. Bot.*, 21 (1934), No. 10, pp. 605-609).—It is shown for *Liriodendron tulipifera* that for any given transpiration rate the role of thermal emission becomes increasingly important with increase in temperature difference between the leaf and the air and, under excessive temperature conditions, may be a deciding factor in preventing thermal death of the leaf tissues.

On the anatomical structure of drought- and heat-resistant leaves [trans. title], B. KELLER (*Ber. Deut. Bot. Gesell.*, 51 (1933), No. 10, pp. 514-522, figs. 5).—Initial studies on anatomical adaptations in leaves of plants capable of resisting desert heat and drought were conducted with the flat-leaved *Rosa persica*, *Psoralea drupacea*, and *Sophora alopecuroides*. In *Rosa* only were the stomata deep sunken. The cuticle was not particularly thick (2-2.5 μ). The veins were extremely long for unit area of leaf, and the number of stomata per unit area was large, being abundant even on the upper surface. The walls of the epidermis were very thick, and, in *Rosa*, a gelatinous substance filled the lumen, evidently some hydrophilic colloid. In *Sophora* the upper epidermal cells enclosed large solid crystals of hesperidin.—(*Courtesy Biol. Abs.*)

Phototropic sensitivity in relation to wave length, E. S. JOHNSTON (*Smithsn. Misc. Collect.*, 92 (1934), No. 11, pp. 17, pls. 2, figs. 4).—"The influence of radiation of different wave lengths on phototropism is briefly reviewed and discussed. Experiments are described in which the plant photometer was used to determine the sensitivity of the coleoptile of *Avena sativa* to the different wave length regions of the visible spectrum. The phototropic sensitivity curve rises sharply from 4,100 a. u. to a maximum at 4,400 a. u. It then drops off to a minimum at about 4,575 a. u. and again rises to a secondary maximum in the region 4,700 to 4,800 a. u. The fall is very rapid from this point to 5,000 a. u., from where it tapers off very gradually to the threshold on the long wave length side at about 5,461 a. u."

Low temperature studies with differently nourished plants, and investigations on their metabolic physiology [trans. title], E. SCHAFFNIT and A. F. WILHELM (*Phytopath. Ztschr.*, 5 (1933), No. 6, pp. 505-566, figs. 19).—An extensive series of studies was conducted with tomato, potato, barley, rye, wheat, and oats, using specially constructed, glass-enclosed, cool-temperature chambers. Plants were grown with normal amounts of N, P, and K, or with a deficiency or an excess of these elements. They were then subjected to different degrees of low temperature for different periods of time, some having previously been hardened off, others not. The effects of the treatments are reported in detail, with the results of chemical analyses, freezing point, and pH determinations of the expressed sap.

With potato and tomato plants, there occurred with the lowering of temperature metabolic changes similar to those occurring in winter-annual cereal plants. The osmotic value of the cell sap is increased, and the sugar and dry-substance content of the cell sap and of the whole plant becomes greater. The water content decreases. At the same time a lowering of the freezing point occurs, which, in these plants, amounts to only a few tenths of a degree.

Osmotic value is increased with N and P deficiency and K excess as compared with normally nourished plants, while with K deficiency it is always very low. Excess N and P exert no clearly observable effect in this connection.

In the cold chamber the lowest freezing points were shown by the $-N$, $-P$, and $+K$ potatoes and tomatoes as compared with the other lots.

The cereal species show variable resistance to low temperatures, according to the nutrition. The relative resistance, however, in variously nourished plants changes in accordance with the degree of cold and duration of exposure in a cold temperature bath. It was found that $+K$ plants were the most resistant when held for rather long periods at a moderately low temperature.

Cold resistance can scarcely be judged by a single criterion. The entire metabolism of a plant must be taken into consideration in connection with its behavior toward low temperatures.

The results indicated that adequate applications of K salts protect best against low temperature damage, much of which arises from excessive transpiration.

Importance of winter cryptovegetation in the forced culture of wheat [trans. title], A. DRAGHETTI (*Ann. Tec. Agr.*, 6 (1933), No. 5-6, pp. 484-501).—By "cryptovegetation" is meant that state of vegetation maintained during the winter, i. e., under low temperature conditions, and characterized by cessation or intermittent functioning of photosynthesis as the result of the climate. Observations on wheat indicate that under these conditions the plant continues to absorb nutrient salts, especially nitrogenous ones, and to carry on metabolic activity, both anabolic and catabolic. The absorbed salts are assimilated and transformed into higher nitrogenous compounds with the aid of the carbohydrates of the reserve or of winter formation. Thus there is an increase in the dry weight of the plant during the winter, and this increase is the measure of cryptovegetative activity. The storage of reserves of amino acids and proteins results in cells rich in protoplasm and with large nuclei, and when vegetative growth is renewed in the spring these undergo intense mitotic activity and cause a vigorous spring flush of growth. In the temperate zone, spring and summer vegetative activity are largely conditioned by winter cryptovegetation through its effect on the vigor of the plant at the beginning of spring. This new concept helps to create a new scientific basis for soil fertilization and shows the fallacy of the old concept of a winter rest period.—(*Courtesy Biol. Abs.*)

Studies on the speeding-up of development and growing of winter wheat in the hothouse [trans. title], J. Voss (*Pflanzenbau*, 10 (1934), No. 9, pp. 321-331, figs. 3).—By using temperatures of about 20° C. and supplementary lighting, winter wheat was brought to maturity in a relatively short time, after being subjected to 1°-4° for from 5 to 6 weeks after seeding, during which time daily illumination for 8 hr. accelerated emergence. Freezing was unnecessary to induce heading.

[Seed germination studies] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1934, pp. 16, 17).—A brief report is given on the investigation of photochemical reactions in the germination of lettuce seed.

Physiological studies on seed germination (*New York State Sta. Rpt. 1934*, p. 32).—Data are given as to the germination response to temperature, moisture, and light of lettuce, mustard, wheat, and tomato seed.

Hetero-auxin as a metabolic product of lower plant organisms: Isolation from yeast [trans. title], F. KÖGL and D. G. F. R. KOSTERMANS (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 228 (1934), No. 3-6, pp. 113-121).—The method of extraction from yeast, from *Rhizopus nigricans*, and from *Aspergillus niger* is described, and the results of tests for the demonstration of the hormone from the extracts are given.

A test method for rhizocaline, the rootforming substance, F. W. WENT (*K. Akad. Wetensch. Amsterdam, Proc.*, 37 (1934), No. 7, pp. 445-455, fig. 1).—Etiolated shoots of pea seedlings (*Pisum sativum*) are used as indicators by a technic which is described. The results of a number of tests are given. Lanolin mixed with rhizocaline readily induced root formation.

On the chemical nature of the rootforming hormone, K. V. THIMANN and F. W. WENT (*K. Akad. Wetensch. Amsterdam, Proc.*, 37 (1934), No. 7, pp. 456-459).—The authors present evidence leading them to the conclusion that rhizocaline is an unsaturated organic acid closely similar to, but not necessarily identical with, the *Rhizopus* auxin and auxin A.

On growth hormone in roots poisoned by erythrosin [trans. title], P. BOYSEN-JENSEN (*Planta, Arch. Wiss. Bot.*, 22 (1934), No. 3, pp. 404-410, figs. 2).—The treatment of seeds of *Vicia faba* and *Pisum sativum* with erythrosin resulted at first in loss of geotropic response in the primary root, accompanied for the most part by absence of the growth hormone. After the latter began to form again geotropic response became evident.

Studies on the pH conditions required for the germination of pollen grains and for vital staining of their vacuoles [trans. title], HUREL-PY (*Compt. Rend. Acad. Sci. [Paris]*, 198 (1934), No. 2, pp. 195-197).—Pollen germination was found to take place most readily in a medium with a pH below 5, while successful vital staining of the vacuoles with neutral red took place between 5.2 and 6.6.—(*Courtesy Biol. Abs.*)

The cytology of the intersexual flowers of *Mercurialis annua*: A morphogenetic study, C. YAMPOLSKY (*Amer. Jour. Bot.*, 21 (1934), No. 10, pp. 651-672, figs. 8).—This paper reports carpels changed into functional stamens, and vice versa, in response to experimental influences. The theoretical implications are discussed.

Heathers and mycorrhizas [trans. title], M. MOLLIARD (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 19, pp. 900-902).—After a short résumé of opinions concerning the importance of the mycorrhizas of *Calluna vulgaris* and an explanation of the method he employed successfully to germinate its seeds, the author states that seeds of *C. vulgaris* germinated and developed in a normal way in a test tube upon cotton constantly kept moist with sterilized, filtered water in which soil taken from beneath *Calluna* plants had previously been soaked.

It is concluded that if the micro-organisms which exist in the soil act upon the plant, it is to create a favorable nutritive medium, i. e., an indirect intervention and not an intimate obligatory association.—(*Courtesy Biol. Abs.*)

Symbiosis as a factor responsible for initiating races among the micro-organisms [trans. title], E. M. PRUZHANSKAJA (E. PRUŽANSKAJA) (*Dok. Akad. Nauk S. S. S. R. (Compt. Rend. Acad. Sci. U. R. S. S.)*, 3 (1934), No. 6, pp. 461-467, figs. 2).—From the original single spore isolate of *Bacillus mycoides* the author obtained four variant forms after growing the original in association

with three other bacterial species (*Bacterium pyocyaneum*, *B. proteus vulgaris*, and *Sarcina ureae*). A study of soil cultures revealed forms of *Bacillus mycoides* similar to two of the variants obtained as indicated above. The author concludes that the formation of races analogous to those observed under artificial conditions occurs in the soil.

This article is in both Russian and French.

Fertilization in *Ascodesmis nigricans* Van Tiegh, D. B. SWINGLE (*Amer. Jour. Bot.*, 21 (1934), No. 9, pp. 519-545, pls. 2).—The author reviews and presents, in a comparative table, the results of previous workers relative to sexuality in the Ascomycetes. In a reinvestigation of *A. nigricans*, nuclear fusion was found to occur both in the ascogonium and in the ascus.

Knob and elevated vein formations on sweet-potato roots, R. F. POOLE (*Phytopathology*, 23 (1933), No. 1, pp. 91-96, figs. 3).—Two nonpathological conditions are described in this contribution from the North Carolina Experiment Station. Knobbiness is reported to result from irregular soil hardening during drought periods. Vein elevation follows second growth of roots in rich, moist soil, especially after drought.

Contributions to the histological study of the coffee tree in Brazil, I-III [trans. title], C. V. FREIRE (*D N C Rev. Dept. Nac. Café [Rio de Janeiro]*, 3 (1934), Nos. 13, pp. 987-991, figs. 5; 14, pp. 215-217, figs. 5; 15, pp. 387, 388, figs. 3).—Descriptions and drawings of the different tissues are given. The first part shows the anatomical structure of the coffee stem and petiole in cross section. The second part shows the anatomical structure of the coffee stem in longitudinal section. The third part shows the structure of the petiole in longitudinal section.

Annual ring formation in *Pinus palustris* seedlings, L. J. PESSIN (*Amer. Jour. Bot.*, 21 (1934), No. 9, pp. 599-603, pls. 2).—It was found that while the seedling is in the "grass" stage no distinct annual rings are evident either in the root or in the stem. Distinction between spring and summer wood was possible only after true terminal buds had been formed and growth in height had begun. Height growth may start 4 yr. after seed germination, or may be delayed 12 or more years.

Contributions regarding the principal annual bast fiber plants [trans. title], S. V. BULGAKOV and A. A. ARNO (*Trudy Inst. Nov. Lub. Syr. (Lenin. Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.)*, 6 (1934), No. 2, pp. 80).—This compares important varieties of *Hibiscus cannabinus*, *Abutilon avicennae*, and *Cannabis sativa* as to fiber quality and other characteristics.

Wild kendir in Eurasia [trans. title], F. N. RUSANOV (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.)*, 7 (1933), pp. 112, pls. 3, figs. 17).—This discusses, in Russian, the species of *Apocynum* and their distribution from the Black Sea region eastward through Turkistan.

Plant material introduced by the . . . Bureau of Plant Industry, October 1 to December 31, 1932, and January 1 to March 31, 1933 (*U. S. Dept. Agr., Inventories 113* (1934), pp. 24; 114 (1934), pp. 38).—These two numbers list, respectively, 427 and 793 lots of plant material, introduced for testing in different parts of the United States. In many cases, descriptive notes are given.

GENETICS

Chiasma frequency in species and species hybrids of *Avena*, J. D. SPIER (*Canad. Jour. Res.*, 11 (1934), No. 3, pp. 347-361, figs. 12).—Chiasma frequency at metaphase was studied in *A. strigosa*, *A. brevis*, *A. wiestii*, *A. barbata*, *A.*

abyssinica, *A. sterilis*, *A. sativa* (Radnorshire Sprig oats), a triploid hybrid *A. barbata* × *A. strigosa*, a pentaploid hybrid *A. abyssinica* "naine" × *A. sterilis* maxima, and a hexaploid hybrid *A. sterilis* (white) × *A. sativa*.

The results were examined in the light of the view that some parallelism may exist between closeness of relationship and similarity in chiasma formation, as genetical control is a factor affecting the process. In respect to proportion of bivalents with 0, 1, 2, 3, or 4 chiasmata as tested by means of the χ^2 test, no significant difference was indicated between the closely related diploid species *A. brevis* and *A. strigosa*, but both differed significantly from the less closely related *A. wiestii*. Lack of significant differences between tetraploid and between hexaploid species might be due to a concentration of genes favoring synapsis and chiasma. High chiasma frequency in the hybrid might be regarded as strong evidence of homology and therefore of relationship between parental forms. The triploid hybrid showed a high chiasma frequency at metaphase consistent with the close relationship of the parental forms. While the pentaploid hybrid had a low frequency, the chiasma frequency of the hexaploid hybrid did not differ significantly from that of its low frequency parent *A. sterilis*. The cytological observations of this hybrid reveal only a slight decrease of nonhomology between parental chromosomes.

Natural and artificial hybridization of *Avena sativa* with *A. fatua* and its relation to the origin of fatuoids. O. S. AAMODT, L. P. V. JOHNSON, and J. M. MANSON (*Canad. Jour. Res.*, 11 (1934), No. 6, pp. 701-727, pls. 2).—Many of the numerous aberrant types of oats, including fatuoids, intermediate between cultivated (*A. sativa*) and wild (*A. fatua*) oats found in fields of oats in Alberta and in various seedstocks were shown to have originated through natural hybridization between cultivated and wild oats. Genetic studies made of both artificial and natural crosses between *A. fatua* and *A. sativa* indicated the probability that the common fatuoid is a normal Mendelian segregate from the crosses in question. While the results are not held to disprove the chromosome aberration or gene mutation theories of origin, they are believed to establish definitely that fatuoids may often originate through natural hybridization between *A. sativa* and *A. fatua*.

Inheritance of characters in *Cajanus indicus*, B. B. DAVE (*Indian Jour. Agr. Sci.*, 4 (1934), No. 4, pp. 674-691, pls. 4).—A study of the inheritance of flower color, pod color, and seed-coat color in the pigeonpea (*C. indicus*) is reported.

The types of standard color studied were purple, orange, plain yellow, yellow with red veins, and yellow with purple veins, base diffused purple. Crosses of yellow × orange flowers gave orange in F_1 and a 3:1 ratio of orange and yellow in F_2 and F_3 segregations as expected. Plain yellow × yellow with back of standard purple gave light purple with deeper veins in F_1 and a 3:1 ratio of purple to yellow in F_2 , but in certain crosses a 9:7 ratio of purple and yellow also was obtained. Yellow with back of standard red-veined × orange gave orange in F_1 , and in F_2 a simple segregation of orange and red-veined. Purple × yellow with purple veins, base diffused purple, gave light purple with deeper veins in F_1 and a 3:1 ratio in F_2 . Yellow, back of standard purple, × orange gave in F_1 flowers with dorsal and ventral surfaces of standard purple and orange, respectively. In F_2 the ratio of these colors on the dorsal surface of standard was 12 purple:3 orange:1 yellow, while on the ventral side segregation of orange gave 3 orange:1 yellow.

Types of pod color studied were dark, maroon-blotched, and green. Crosses of green × dark gave dark in F_1 and a 9:3:4 ratio of dark, maroon-blotched,

and green in F_2 . The segregations in dark \times maroon-blotched and maroon-blotched \times green indicated a monohybrid inheritance.

The types of seed-coat color studied were purplish black, brown, and white. Crosses of brown \times white gave brown in F_1 and 3 brown: 1 white in F_2 . In purplish black \times white, F_1 was purplish black and gave in F_2 9 purplish black: 3 white with purple spots: 3 brown: 1 white. Brown \times purplish black gave purplish black in F_1 and 3 purplish black: 1 brown in F_2 .

Orange-yellow flowers and purplish black seeds were completely linked in inheritance. Purple at the back of standard was closely linked with maroon color of the pod. Complete linkage was also noted between yellow flowers with back of standard having purple veins, base diffused purple, and green pods.

F_2 endosperm development in relation to breeding technique with interspecific wheat crosses, J. B. HARRINGTON and J. B. MARSHALL (*Canad. Jour. Res.*, 11 (1934), No. 3, pp. 333-346).—The relationship between endosperm development and plant type was studied in the F_2 generation of the wheat crosses Iumillo (*Triticum durum*) \times Marquis (*T. vulgare*), Marquis \times Black Persian (*T. persicum*), and Vernal (*T. dicoccum*) \times Marquis, the latter from data published earlier (E. S. R., 65, p. 820). F_2 seeds of each cross were grouped as plump, slightly shrunken, and shrunken. Seed plumpness proved to be closely related to seedling emergence. In general the decrease of *vulgare*-ness of the plants was associated with that of shrunkenness of the seeds, the most shrunken seeds producing the most *vulgare*-like plants. However, numerous exceptions were noted. The *T. durum* \times *T. vulgare* cross was high in percentage of shrunken seeds and relatively high in the proportion of *vulgare*-like plants from plump seeds. *T. dicoccum* \times *T. vulgare* was low in proportion of shrunken seeds and had relatively few *vulgare*-like plants from plump seeds. In these crosses it seemed unnecessary for the breeder to consider differences in F_2 seed plumpness. Since the *T. persicum* \times *T. vulgare* cross showed a fair proportion of shrunken seeds but had relatively few *vulgare* plants from plump seeds, it would appear advisable in this cross to have an abundance of F_2 seeds and to sow only the more shrunken half.

The inheritance of quality in Trumbull and Michikof varieties of winter wheat, W. W. WORZELLA (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 8, pp. 705-714).—The inheritance of quality, as determined by the wheat-meal fermentation time test, was studied at the Indiana Experiment Station on F_1 to F_3 progenies of a cross between Trumbull, a weak gluten parent, and Michikof, a strong gluten parent, grown under field conditions during 1931-32 and 1932-33.

The gluten strength of F_1 seed was weak when Trumbull was used as the female parent and strong when Michikof served as the female parent. The F_1 plants (F_2 endosperm) were intermediate to the parents in quality. In the F_2 generation the hybrids were intermediate in gluten strength, although plants varied from the weak to the strong gluten parent. The F_3 families as a whole were intermediate to the parents in quality, yet families as weak as Trumbull and as strong as Michikof were obtained. Some bred true while others showed coefficients of variability ranging from 7 to 37 percent, depending on whether one or more genetic factors for gluten strength were segregating.

By assuming that, in the varieties studied, quality is a quantitative character governed by three major independent factor pairs, Trumbull had the genotype $s_1s_1 s_2s_2 s_3s_3$ and Michikof $S_1S_1 S_2S_2 S_3S_3$. Correlation of the time of the F_2 and F_3 data, $+0.842 \pm 0.024$, indicated that gluten quality obtained in early generations could serve as a dependable guide in selecting for quality. Significant positive interannual correlation coefficients for time, obtained be-

tween results of different seasons when wheats of diverse nature were grown under similar environmental conditions, presented additional evidence that gluten strength is an hereditary quantitative character and is apparently accurately measured by the fermentation test.

Correlated inheritance with special reference to disease resistance in spring wheat. L. G. KULKARNI (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 885-893).—Inheritance of reaction to a collection of physiologic forms of stem rust, as studied at the University of Minnesota, in F_3 lines of a cross between the highly resistant Hope and the highly susceptible Liguleless wheat, was explained on the basis of a dominant factor for resistance, R , carried by Hope, and an inhibitory factor, I , carried by Liguleless, which, in the presence of R , gives susceptibility. Study of F_3 lines of a cross between Ceres \times Hope, resistant, and Ceres \times D. C., moderately resistant, showed the Hope type of resistance was differentiated by a single factor pair. Although the semi-resistant type of rust reaction did not reduce yield in a demonstrable manner, it decidedly affected plumpness of kernels. Inheritance of ligule was explained on the basis of two pairs of dominant duplicate factors.

The mutating snaky cotton plant [trans. title], S. TERADA and S. HORIO (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi)*, 6 (1934), No. 1, pp. 4-6, figs. 3; *Eng. abs.*, p. 6).—Deformed plants in an improved upland strain differed from normal in their spirally twisted stalks, undulate branches and leafstalks, wavy leaves, shorter and more tangled lint, and in their seedling progeny in undulate cotyledons and young leaves and snaky hypocotyls.

Hybrid vigour in reciprocal crosses in Cucurbita pepo. S. F. PASSMORE (*Ann. Bot. [London]*, 48 (1934), No. 192, pp. 1029, 1030).—At Columbia University marked hybrid vigor was observed in the F_1 generation of crosses between inbred pure lines of squash. Hybrids from large embryos were larger during their early development than those from small embryos, with the difference becoming less as time proceeded. In fact when the final records were taken the differences in leaf number and leaf size were no longer evident.

A preliminary note on chromosome numbers in Iris. C. L. BECKER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 591-593).—Data are presented on the chromosome constitution of four species and some horticultural varieties of *Iris*.

Twinning in cattle. A. C. T. HEWITT (*Jour. Dairy Res. [London]*, 5 (1934), No. 2, pp. 100-107).—Previously noted from another source (E. S. R., 72, p. 463).

Inherited susceptibility to acute mastitis in cattle. W. T. WHITE and H. L. IBSEN (*Jour. Heredity*, 25 (1934), No. 12, pp. 489, 490).—The occurrence of acute mastitis in a cow, her daughter, and granddaughter in the crossbred Gallo-way-Holstein herd at the Alaska Experiment Station is described. All four quarters of the udders were lost in each case.

Contribution to the inheritance of pork production, I-III [trans. title], J. SCHMIDT, E. LAUPRECHT, and W. WINZENBURGER (*Züchtungskunde*, 9 (1934), Nos. 1, pp. 4-23, figs. 23; 6, pp. 201-206; 8, pp. 287-300, figs. 5).—Three papers dealing with studies of the fattening qualities of crossbred pigs are presented.

I. Relation to conformation in the F_1 generation.—Data are given on various body measurements of boars and sows of the following breeds and crosses between them: English Berkshire, German Improved Landschwein, Hanover Brunswick Landschwein, English Middle White, American Hampshire, Württemberg Halle Landschwein, and German Wild swine. The measurements were made on animals weighing approximately 100 kg. The crossbred pigs seemed to excel the purebreds in the more important measurements of the regions producing the valuable cuts.

II. *Utilization of nutrients and fattening in the F_1 generation.*—Data are reported on the starch value, in grams, required to produce 100 kg in live weight, while the pigs were growing from 30 to 100 kg in weight, in the parents and crossbreds of which the larger numbers were produced in the above experiment. The feed required per unit of gain by the hybrids was, in all except the wild swine crosses, intermediate between the two parents. In general, the gains of the crossbreds were made as rapidly as, or more rapidly than, the most rapidly gaining parent, except in the wild swine crosses.

III. *Results of slaughtering the F_1 generation.*—Data are given on the carcass and cutting yields of the purebred and crossbred pigs in this experiment.

Defective skulls inherited in swine, E. H. HUGHES and H. HART (*Jour. Heredity*, 25 (1934), No. 3, pp. 111–115, fig. 1).—The occurrence, in the Poland China herd at the California Experiment Station, of 4 pigs with defects in the skull where the frontal and parietal bones join is noted. These pigs occurred among 159 farrowed in sire-to-daughter matings and were evidently due to the operation of a recessive factor. Of the 4 defective pigs, 2 died soon after birth, 1 died on developing anemia (due to other conditions), and 1 was finished at about 200 lb.

Congenital defects in the mammae of swine, J. E. NORDBY (*Jour. Heredity*, 25 (1934), No. 12, pp. 499–502, figs. 3).—The author describes inverted nipples appearing in swine, a condition which is evidently hereditary and renders the gland nonfunctional.

An analysis of size genes, C. V. GREEN (*Amer. Nat.*, 68 (1934), No. 716, pp. 275–278).—A statistical study of the correlations between size and color characters in the mouse cross of the species *Mus musculus* and *M. bactrianus* (E. S. R., 70, p. 759) indicated that both general and group genetic factors operate in the determination of size inheritance.

Embryological analysis of gene manifestation in Little and Bagg's abnormal mouse tribe, K. BONNEVIE (*Jour. Expt. Zool.*, 67 (1934), No. 3, pp. 443–520, figs. 27).—The results of histological studies are reported of the appearance of blebs in from 1- to 17-mm embryos in a mouse strain from Bagg and Little showing eye and foot abnormalities (E. S. R., 52, p. 131) and outcrosses with other strains. The studies substantiated previous conclusions that the abnormalities resulted from bleb formation, which was primarily controlled by a recessive character and subject to modification by other factors.

The blebs formed below the epidermis in the neck region of from 7- to 8-mm embryos from fluid expelled from the medullary tube. The location of the bleb was gradually moved along the median dorsal line and finally came to rest in the concavity of the eye or at the end of the feet. Wherever the bleb remained the pressure caused a breaking down of the capillaries and interfered with the developmental processes.

Crosses behaved differently as regards the prevalence of foot and eye abnormalities, suggesting the operation of genetic factors modifying the specific surface curvature and thus modifying the specific location of the bleb.

In a postscript a discussion is given of a paper by Plagens¹ in which the start of the bleb is concluded to be due to blood extravasations or hematomas. Reasons for the hypothesis advanced by Bonnevie are presented.

Linkage of "wide-band" and "agouti" genes, P. B. SAWIN (*Jour. Heredity*, 25 (1934), No. 12, pp. 477–481, figs. 2).—Several matings of rabbits heterozygous for agouti and wide-band factors (E. S. R., 68, p. 751) showed marked deviations from the expectation in the character of the offspring in

¹ Jour. Morph., 55 (1933), pp. 151–153.

case of independent segregation of these two characters. A combination of all back-cross matings of double heterozygous females with recessive males produced 150 noncrossovers to 64 crossovers. The crossover percentage for females was 29.9 ± 2.3 . In studying the interaction of the wide band factor (W) with the steel factor (E^D), matings were made by crossing wide-banded agoutis ($A-E-ww$) with blacks ($A-E^D E^D WW$). Five of the six expected types were produced. It appears that the factors for steel and wide band are both accessory modifying genes which reduce the width of the submarginal band on the hair of agouti rabbits. Variations in the width of the band, aside from the influence of these genes, also occurred. Progress was made in the selections for wide and narrow bands in stocks homozygous for the E^D and W factors.

The nature of susceptibility to cancer in mice, L. C. STRONG (*Jour. Heredity*, 25 (1934), No. 3, pp. 119-121, fig. 1).—Selections for and away from the early incidence of mammary carcinoma in a strain of mice showing a relatively high cancer incidence after inbreeding for 27 generations by brother and sister matings were ineffective in modifying the age incidence to the cancer in subsequent generations. The results thus confirm the hypothesis that "selection within a pure line is ineffectual."

Investigation of the inheritance of blood group antigens in fowls [trans. title], O. THOMSEN (*Hereditas*, 19 (1934), No. 3, pp. 243-258).—Studies of blood groups in fowls by interagglutination experiments between offspring and parents immunized to the blood of other birds revealed a multiple number of blood groups in fowls. The agglutinogens in the blood of the progeny were generally completely removed by reaction with the blood of both parents. Three exceptions are cited.

Studies on embryonic lethal characters in the domestic fowl, C. W. UPP (*Louisiana Sta. Bul.* 255 (1934), pp. 82, figs. 4).—The types of abnormalities found among 4,180 dead embryos from 16,462 fertile eggs incubated at the Louisiana and Iowa Experiment Stations are described, including the age of the embryos at death and their sex. Of the dead embryos found, 63.79 percent showed abnormalities of various sorts. The most frequent type observed was chondrodystrophy, which was noted in 6.55 percent of the dead embryos and 1.79 percent of all the eggs incubated. Various kinds of hemorrhages were noted in 6.67 percent and edema in 3.17 percent of the dead embryos examined. Malpositions constituted 22.94 percent of all embryos dying in the shell.

The method of breeding and the strain were found to bear a definite relationship to the number and character of the abnormalities observed among the dead embryos. The occurrence of abnormalities of the eye and abnormal membranes varied with the season, whereas chondrodystrophy did not show variations in its incidence which could be associated with the season of the year.

The sex ratios of the dead embryos did not show significant departures from normal in the different types of matings except in the highly inbred strains of Leghorns, in which dead embryos were only 37.90 percent males. The abnormal embryos produced by certain sires suggested that some of the males in the highly inbred Leghorn stock were carriers of the sex-linked lethal factor. Several of the sons of these birds were also found to be carriers. The results of specific matings involving the inheritance of dwarfism showed that it behaved as a simple autosomal character.

The histological and physiological differences between dwarfism, stickiness, creeper, and chondrodystrophy are mentioned as important for future work.

Variation and heredity of some characters in White Leghorns, Rhode Island Reds, and Barnevelders.—II, Weight, growth, and sexual maturity

in the three breeds, J. AXELSSON (*Lunds Univ. Årsskr., n. ser., Sect. 2, 29 (1933), No. 1, pp. 71, figs. 8*).—Continuing the studies of the mode of inheritance of contrasting characters in the crosses of White Leghorn, Rhode Island Red, and Barnevelder breeds (*E. S. R., 70, p. 462*), data are presented on weight, growth, and age at sexual maturity of birds produced in 27 different types of matings. The usual statistical constants are given in detail, together with correlations observed in the different groups between the several characteristics measured.

X-irradiation of the ovaries of guinea-pigs and its effect on subsequent pregnancies, I. T. GENTHER (*Amer. Jour. Anat., 55 (1934), No. 1, pp. 1-45, pls. 4*).—In continuing these studies (*E. S. R., 66, p. 423*), data are reported on the characteristics of the estrous cycle, pregnancy, and conditions associated with them as influenced by X-irradiation.

The average length of 187 normal estrous cycles was 16.1 days, but various irregularities were noted in the normal animal. Irradiation with two-thirds of the minimum sterilization dose caused a temporary cessation of the estrous cycle, but normal cycles followed in 9 of the 13 animals treated. Where pregnancy followed, the litters were small and the numbers of follicles in the ovaries were reduced.

Irradiation with the minimum sterilization dose was followed first by apparently normal cycles, but as the ovaries became filled with interstitial tissue the cycles were irregular. A high percentage of the 23 animals treated refused to mate or matings were infertile, with abortions in the event of conception in most cases. Such litters as were produced consisted of 1 each. Abortions followed the filling of the ovaries with interstitial tissue during gestation.

Immature animals were irradiated in 2 groups, 1 ranging in age from 2 to 4 weeks and in weight from 80 to 150 g, and the other ranging in weight from 150 to 250 g. The results were comparable as far as breeding, conception, etc., were concerned.

In the group of animals subjected to the two-thirds of the minimum sterilization dose, it may thus be observed that the amount of ovarian injury was directly related to the conditions of matings and abortions.

Concentration of the gonadotropic hormone in pregnant mare's serum, H. M. EVANS, E. L. GUSTUS, and M. E. SIMPSON (*Jour. Expt. Med., 58 (1933), No. 5, pp. 569-574*).—Attempts were made to concentrate the gonadotrophic hormone from the blood of pregnant mares. A preparation obtained by the adsorption of the hormone on active aluminum hydroxide followed by elution showed demonstrable effects on the ovaries of 21-day-old mice within 100 hr., and on the testicles and seminal vesicles of immature rats.

Uterine reaction to sex hormones in the immature guinea pig, A. G. KING (*Endocrinology, 18 (1934), No. 4, pp. 539-542, fig. 1*).—Changes in the size of the uteri of immature guinea pigs in response to injections of pregnancy urine, theelin, and theelol preparations were irregular.

The recognition and comparison of prolán and prolán-like substances, H. M. EVANS, M. E. SIMPSON, and P. R. AUSTIN (*Jour. Expt. Med., 58 (1933), No. 5, pp. 561-568*).—Tests were made of the presence of prolán-like substances in the blood and urine of animals other than primates, with the aid of the synergic substance. The results showed that the "serum of pregnant and nonpregnant cow, pregnant and nonpregnant pig, and urines of pregnant and nonpregnant guinea pig and pregnant dog were all negative when injected alone, and all gave activation when combined with the synergic factor. The urine of pregnant and nonpregnant rabbits, however, showed but slight activation when tested similarly, and the urine of pregnant mares none at all."

Pregnancy was not distinguished from nonpregnancy in these animals. Stimulation of the development of the immature seminal vesicles also followed the administration of the synergic substance with pregnancy prolan.

Further studies on the hypophyseal substance giving increased gonadotropic effects when combined with prolan, H. M. EVANS, M. E. SIMPSON, and P. R. AUSTIN (*Jour. Expt. Med.*, 58 (1933), No. 5, pp. 545-559, figs. 2).—Data are given on the influence of the synergic factor, isolated from the anterior lobe of the hypophysis (E. S. R., 69, p. 511), and the gonadotrophic hormones, singly and in combination, on ovarian weight.

The synergic factor alone provoked only moderate ovarian development. By isoelectric precipitation or tryptic and ereptic digestion, the synergic principle was freed of many contaminating factors.

The control of the secondary sex characters in the English sparrow, *Passer domesticus* (Linnaeus), W. N. KECK (*Jour. Expt. Zool.*, 67 (1934), No. 2, pp. 315-347, pls. 3, figs. 6).—In studies of the influence of the hormones of the gonads on secondary sex characters in the English sparrow, 65 males and 48 females were gonadectomized. It was found that the color of the bill in males and size of the oviduct in females were modified by the removal of the gonads.

The sex determination test of Dorn and Sugarman. Report of 51 experiments, D. P. MURPHY and G. S. DE RÉNYI (*Endocrinology*, 18 (1934), No. 4, pp. 521-526).—The authors report negative results from studies of the sex-determination test of Dorn and Sugarman,² involving the injection of urine of women 5 mo. or more pregnant into 3-month-old male rabbits with testicles in the inguinal canal. The test was applied in 51 cases.

FIELD CROPS

[Crops research of the U. S. Department of Agriculture, 1934] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1934, pp. 90, 91, 92).—Brief progress reports are given on breeding work with wheat, oats, corn, alfalfa, and sugarcane; and the introduction of Korean lespedeza and varieties of soybeans and sugarcane.

[Research with field crops in the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1934, pp. 2, 3, 4, 5, 6, 8-10, 19, 20, 21, 22).—Reviews are given of the progress and accomplishments in breeding work with corn, wheat, barley, oats, grain sorghum, sorgo, rice, seed and fiber flax, cotton, sugar beets, sugarcane, and red clover; varietal studies with wheat, barley, fiber flax, miscellaneous forage plants, and soybeans; study of factors involved in the germination of *Poa compressa*; method of shipping seed of Chewings fescue from New Zealand; storage tests with soybean seed and sugarcane (E. S. R., 72, p. 471); methods of treating frozen sugarcane (E. S. R., 72, p. 179); improvement of milling technic with rice; the merits of concentrated synthetic fertilizer salts and of different cropping systems, factors affecting the nicotine content, and differences between cigar and cigarette types in chemical and physical characteristics, all with tobacco; community production of cotton; fertilizer, retting, and hickling tests with fiber flax; response of seed flax to environment in yield and quality; a study of vernalization; and pasture research dealing with continuous v. deferred grazing for North Dakota pastures and bluegrass, grazing management of Korean lespedeza, and response of pastures to fertilizers. Many of the studies were in cooperation with State experiment stations.

² *Jour. Amer. Med. Assoc.*, 99 (1932), No. 20, pp. 1659, 1660.

[**Agronomic research in California**] (*California Sta. [Bien.] Rpt. 1933-34*, pp. 23-32, 40, 41, 43-45, 46-50, figs. 2).—Significant findings and developments and their application to problems of California are described from the results of breeding work with barley, wheat, corn, rice, and cowpeas; studies of the effects of nutrients and soil conditions on the quality of wheat and barley; fertilizer tests with rice; experiments with flax in the Imperial Valley; cutting tests with alfalfa; trials of oats-legume mixtures for hay; and experiments with sugar beets concerned with planting on ridges or beds, mechanical v. hand-blocking, sprinkling or overhead irrigation, crop rotation, and production on peat soils. The extensive program of research on weed control dealt with losses, extent of infestations, soil sterilization with arsenic trioxide as sodium arsenite to control weeds on noncropped areas, determinations of the toxicity and fixing power of sodium arsenite and sodium chlorate in typical soils, control of deep-rooted perennials with acid-arsenical sprays, use of chlorates for perennials, control of morning-glory by culture and cropping practices, control of grain field weeds by dilute sulfuric acid sprays, control of Klamath weed by different methods, and fighting Russian thistle by fencing out and other measures. Several phases of the work were in cooperation with the U. S. Department of Agriculture.

[**Field crops work in West Virginia, 1933-34**] (*West Virginia Sta. Bul. 263 (1934)*, pp. 11, 12, 17, 18, figs. 2).—Agronomic experiments (E. S. R., 68, p. 755) at the station and substation, for which progress results are reported on briefly for the biennium ended June 30, 1934, comprised breeding work with soybeans, including the Pekwa and Kingwa varieties (E. S. R., 66, p. 735), and wheat; variety and seeding tests with barley; studies of fertilizer needs of and improvement methods for pasture in cooperation with the U. S. Department of Agriculture; and fertilizer and cover crops tests with potatoes.

[**Experiments with field crops in Wyoming**] (*Wyoming Sta. Rpt. 1934*, pp. 4, 5, 30, 31, 32, 33, 35, 36, 38, 39-41, 43).—Progress results are reported from experiments (E. S. R., 70, p. 763) at the station and substations, including variety tests with winter and spring wheat, oats, barley, corn, potatoes, beans for seed, alfalfa, and miscellaneous forage grasses and mixtures; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, potatoes, and alfalfa; fertilizer trials with alfalfa and sugar beets; seed treatments for potatoes; crop rotations and methods of preparing seedbeds; pasture studies; and control of morning-glory and quackgrass. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[**Agronomic investigations of the Agricultural Research Institute, Pusa, 1931-33**], W. McRAE, F. J. F. SHAW, W. SAYER, T. S. VENKATRAMAN, N. L. DUTT, and J. N. MUKERJI (*Imp. Inst. Agr. Res., Pusa, Sci. Rpts. 1931-32*, pp. 4-8, 20-38, 57-76, 79-96, 99-103, pls. 2; 1932-33, pp. 3-8, 20-42, 59-83, 85-107, 111-117, pls. 3).—Continued breeding work and other research with important cereal, legume, fiber, and oilseed crops, tobacco, and sugarcane are reported on briefly as heretofore (E. S. R., 66, p. 131).

The border effect in plot experiments, A. V. COOMBS (*Empire Jour. Expt. Agr.*, 2 (1934), No. 8, pp. 315-323).—Examination at the Rothamsted Experimental Station of the results of several cultural and fertilizer experiments with marrowstem kale and sugar beets, in which border rows were harvested separately, showed that the rejection of border rows did not appreciably increase the standard errors of the experiment. It was shown that in experiments where the plats are narrow or very small, retention of border rows will give decidedly biased estimates of treatment differences, due to the trespassing and competition effects of the treatments on the border rows. In fertilizer experiments

the discarding of border rows may give more biased results than their retention, due to unequal distribution of the fertilizers between the centers and outer parts of the plats.

Vernalization: Tests conducted at Canberra, F. C. T., J. R. A. McMILLAN, C. S. CHRISTIAN, and K. L. HILLS (*Jour. Council Sci. and Indus. Res. [Aust.]*, 7 (1934), No. 3, p. 178).—Vernalization of seed of three wheat varieties, corn, tomatoes, soybeans, field peas, Sudan grass, and Japanese millet, according to methods outlined by Whyte and Hudson (*E. S. R.*, 70, p. 166), did not give significant differences over untreated material.

The response of grasses and clover to treatment on acidic upland soils, and the effect of herbage plants on the reaction of acidic soils, R. O. DAVIES and H. G. CHIPPINDALE (*Empire Jour. Expt. Agr.*, 2 (1934), No. 8, pp. 324-336).—The response of acidic upland soils to single and joint treatments including cultivation, fertilization, and seeding with cultivated grasses and wild white clover was studied from 1931 to 1933 on a defectively drained *Molinia* soil with a pH value of 3.76.

The combination of fertilizing and cultivation gave a dry matter richer in nitrogen, lime, and phosphorus than the natural herbage fertilized only, and increased the yield for dry matter even in the third season after treatment. The seeds mixture of perennial ryegrass, orchard grass, and wild white clover produced more dry matter than manured and cultivated natural herbage in the ratio 146:100 for the three seasons. The nitrogen and lime contents of the natural herbage were improved by treatment, but were low compared with those of the seeds mixture. A high protein content was found in the sod containing clover and the clover also enhanced the lime content. Turf of cultivated grasses and wild white clover receiving no nitrogen yielded more dry matter during the period than a sod of cultivated grasses heavily fertilized with soluble nitrogen. Basic slag, especially in conjunction with limestone, effected substantial increases in the yield of dry matter, nitrogen, lime, and phosphorus in the herbage.

The ecological and physiological action of ammonium salts on the clover content of turf, G. E. BLACKMAN (*Ann. Bot. [London]*, 48 (1934), No. 192, pp. 975-1001, figs. 15).—A further study of the effect of nitrogenous compounds on the botanical composition of closely cut turf gave additional evidence that the reduction of clover (*Trifolium repens*) caused by ammonium sulfate is due to a toxic action of the absorbed ammonium ions. Weekly or fortnightly applications of ammonium sulfate at the rate of 3 lb. per 1,000 sq. ft. led to a greater reduction in *T. repens* than did sodium nitrate, calcium nitrate, or urea at equivalent rates. Ammonium nitrate in 1931 was intermediate in effect between ammonium sulfate and calcium nitrate. In 1932 ammonium sulfate at two-thirds the standard rate still caused a reduction of the clover.

Adding sucrose, 10 lb. per 1,000 sq. ft., with each application of ammonium sulfate reduced the clover content more slowly than ammonium sulfate alone. Sucrose alone had no effect, and when added to either calcium or sodium nitrate had little effect on their action. On the hypothesis advanced, the addition of sucrose to ammonium sulfate should lead to a slower rate of the reduction of the clover, since the absorption of sucrose with the ammonium ions should reduce the drain on the carbohydrate reserves. Sucrose alone did not affect the growth of the turf much, and sucrose added to ammonium sulfate, urea, or calcium nitrate only slightly reduced the growth resulting from the nitrogen carrier alone.

Measurement of the nitrogen removed in the herbage and of the ammonia- and nitrate-nitrogen content of the soil did not account for the total added nitrogen.

Study of fluctuations in the yield of weekly cut plats and weekly changes in the inorganic nitrogen content of the soil suggested that much of the nitrogen added to the turf is absorbed immediately by soil micro-organisms. Subsequently, some of this nitrogen may again be released and become available.

Artificial watering of lawn grass, F. A. WELTON, J. C. CARROLL, and J. D. WILSON (*Ecology*, 15 (1934), No. 4, pp. 380-387, figs. 4).—On plats watered artificially at the rates of 1.5, 2, and 3 times the normal from 1927 to 1931, at the Ohio Experiment Station, the stand of Kentucky bluegrass gradually became inferior to that on plats receiving no water except rainfall, which remained good. The grass was poorer as the rates increased.

Tests of a watering method, employing Livingston's standardized, spherical, black atmometers (E. S. R., 34, p. 34) to indicate the time of application, suggested that on a soil like Wooster silt loam grass should be maintained in a good growing condition if watered as soon after a rain as evaporation from a black atmometer equals 320 cc of water. On the basis of this method in a year like 1932 with rainfall from May to September, inclusive, 66 percent of normal, approximately 8,000 gal. of water per 1,000 sq. ft. would be needed to keep grass in a green and satisfactory growing condition. See also an earlier note (E. S. R., 65, p. 822).

Stem structure of grasses on the Jornada Experimental Range, R. H. CANFIELD (*Bot. Gaz.*, 95 (1934), No. 4, pp. 636-648, figs. 8).—The main observations in this more detailed account have been noted earlier (E. S. R., 70, p. 321).

The close-grazing scheme of pasture management.—The influence of successive applications of nitrogen on the composition and yield of the herbage, F. T. SHUTT and S. N. HAMILTON (*Jour. Agr. Sci. [England]*, 24 (1934), No. 3, pp. 341-348).—Study of the effects of from 1 to 4 applications of nitrochalk on yield and composition of the grass in 1932 and 1933 on the same area as earlier work (E. S. R., 68, p. 36) showed the marked influence of nitrogen in increasing the yields of dry matter and protein and confirmed previous results as to the high protein character of young grass. The influence of the fertilizer upon percentage of protein could not be appraised accurately. Ample and well distributed rainfall was found to be a most important factor in the successful operation of the close grazing scheme of pasture management.

Cereal hays for Ohio, L. E. THATCHER (*Ohio Sta. Bul.* 543 (1934), pp. 13).—This practical discussion of the advantages of cereals for hay, based largely on experiments by the Ohio and other experiment stations, considers yields, nutritive values as affected by stage of maturity and soil fertility, and the relative merits of oats, wheat, barley, rye, and legume-cereal mixtures, especially oats and field peas for hay, and indicates suitable varieties and field practices.

Alfalfa in Ohio, C. J. WILLARD, L. E. THATCHER, and J. S. CUTLER (*Ohio Sta. Bul.* 540 (1934), pp. 146, figs. 36).—Further experimental results of the department of agronomy of the station on the culture and management of alfalfa (E. S. R., 18, p. 1039), brought together by the authors and others of the staff and already extensively noted, were concerned with the choice of soil for alfalfa; tile drainage; liming and fertilizers; varieties; place of alfalfa in rotations and mixtures; rate, date, and method of planting; management practices including clipping after planting, mulching, cultivation, reseeding, and time of and number of cuttings; effect of time of cutting on storage of organic reserves in the roots; effect of leaf hoppers on alfalfa; and the normal development of the crop up to the first cutting for hay and stands after the first cutting. Miscellaneous studies dealt with the effects of season and age on percentage of leaves and protein in hay, protein content of leaves and stems,

correlation between percentages of leaves and protein in hay, composition of alfalfa stubble, the comparative protein content of alfalfa and red clover, bacterial wilt of alfalfa, seed production problems, dry-green ratios of roots, effects of soil type and acid and poorly drained soils on roots, depths reached by roots the first season, and relation between June rainfall and root development in new seedlings. Some phases of the research were in cooperation with the U. S. Department of Agriculture. The literature cited embraces 78 titles.

Effects of inbreeding on variability in alfalfa, G. STEWART (*Jour. Agr. Res.* [U. S.], 49 (1934), No. 8, pp. 669-694, figs. 4).—Eight characters were studied in parent plants of each of the Utah and Dakota common, Grimm, Saskatchewan No. 666 (Grimm), Hardigan, and Ontario Variegated varieties of alfalfa and numbers of their inbred progenies grown by the Utah Experiment Station to determine the effect of inbreeding on variability. The significantly lower variability in progenies with respect to plant height, plant width, stem diameter, leaflet length and width, blossom color, and foliage color as a result of one generation of inbreeding indicated that alfalfa is much less heterozygous than commonly thought to be. The tendency toward uniformity as a result of inbreeding was less marked for plant erectness than for plant height or plant width, except in the previously close-bred Saskatchewan No. 666, which seems to have become as relatively uniform in erectness as in height or width.

A high degree of correspondence was found between the results obtained by the probable error method and Fisher's z test. The correspondence both for coefficients of variability and for standard deviations was so close that either method almost fully duplicates the other.

Yield, duration, and drought-resistance of lucerne as influenced by frequency and time of cutting, H. NICOL (*Empire Jour. Expt. Agr.*, 2 (1934), No. 8, pp. 380-390, figs. 2).—This review of cutting experiments with alfalfa also considers the effects of clipping grasses, clovers, and nonlegumes, and embraces 48 titles.

Effect of chemical treatments of seed corn on stand and yield in Kansas, L. E. MELCHERS and A. M. BRUNSON (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 909-917).—Since no significant advantages in yield, quality of crop, or proportion of lodged or barren plants were observed from the treatment of seed corn, by the Kansas Experiment Station and the U. S. Department of Agriculture cooperating, with any of the various commercial chemical disinfectants thus far tested, chemical treatment of seed corn is not advised as a general practice for Kansas. Greater reliance should be placed in the field selection of sound, well-matured seed ears from erect stalks, to be followed by thorough and quick drying. The occurrence of fungus organisms on Kansas seed corn is described briefly.

Effect of Sudan grass and of soybeans on yield of corn, F. S. WILKINS and H. D. HUGHES (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 901-909).—In 2-yr. rotations on fertile O'Neill sandy loam at the Iowa Experiment Station between 1919 and 1933, corn after Sudan grass averaged 50.8 bu. per acre, after soybeans 49 bu., and after oats 47.8 bu., but the differences were not deemed statistically significant. Results were not changed by applying phosphate at corn planting time in the later years. Although Sudan grass removed over twice as much dry matter as soybeans or oats, over twice as much nitrogen as oats, and appreciably more than soybeans, the Sudan grass plats appeared as productive after 13 yr. of cropping as the other plats. Fall plowing Sudan grass stubble increased the yield of corn 10.7 percent over spring plowing. Yields in dry years and water determinations of the soil indicated

that moisture deficiency is not a cause of depressed yields sometimes obtained after Sudan grass.

Studies in growth analysis of the cotton plant under irrigation in the Sudan.—I, The effects of different combinations of nitrogen applications and water-supply, F. CROWTHER (*Ann. Bot. [London]*, 48 (1934), No. 192, pp. 877-913, figs. 12).—Sakellaridis cotton grown at the Gezira Research Farm received light, medium, and heavy irrigation and three levels of nitrogen (supplied by ammonium sulfate) in all possible combinations. The morphological and physiological processes resulting in the final crop were studied, and the measurements dealt with rates of change and growth curves rather than with the integration of these values as expressed by the final crop yield (E. S. R., 68, p. 38).

Observations on numbers of flowers, numbers of nodes on the remaining stem, and on relative leaf-growth rates demonstrated the function of nitrogen in stimulating meristematic activity. The function of water in extension growth was shown by the internode lengths on the main stem, and it is suggested that its effect on flower numbers is indirect through regulation of extension growth. Net assimilation rate evidently is unaffected by water or nitrogen supply during the main growth phase.

The bolls appeared to exert a dominating effect on the whole plant when their development begins, resulting in the cessation of apical growth of the main stem and in the stoppage of nitrogen uptake from the soil, presumably through the checking of root growth. The nitrogen supply to the plant as a whole is interrupted at the time of the most serious drain on the plant's nitrogen reserves by developing bolls. It is suggested that the cessation of root growth operates through interference with the carbohydrate supply to the roots. The type of interaction between the factors was such that the increase in response to either factor increased with a higher level of the other. The practical importance of the results, particularly as to the necessity for obtaining favorable early growth, is stressed.

Differences between Korean and other annual lespedezas in root nodule formation, J. F. DUGGAR (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 917-919).—Korean lespedeza (*L. stipulacea*) growing on Norfolk soils at the Alabama Experiment Station developed significantly fewer nodules per plant than did common, Tennessee 76, and Kobe lespedeza, all of which formed nodules promptly and abundantly, and this held true at every date of examination throughout each of 5 yr. The inoculation of seed of Korean lespedeza in eight experiments invariably resulted in small but consistent increases in number of nodules over those on noninoculated plants of this species.

Yarovization formulas for winter oats, D. N. BORODIN (*New York: Author*, 1934, pp. 16, fig. 1).—Experiments made at Rosslyn, Va., and Aberdeen, Idaho, in 1933 in cooperation with the U. S. Department of Agriculture demonstrated that winter oats respond to yarovization (vernalization) of their seed by acceleration of the reproductive stage. The formula (A—moisture percentage based on dry weight of seed:B—duration of treatment in days:C—temperature in degrees C.) is said to be specific for any one strain of winter oats. Seed so treated might be dried to 25 to 35 percent or less of moisture without effecting yarovization. Winter oats grown from yarovized seed appeared less subject to infection by crown rust. The bibliography includes 58 titles.

Seed yields of Rhode Island colonial bent (*Agrostis tenuis* Sibth) as influenced by the kind of fertilizer applied, H. F. A. NORTH and T. E. OBLAND (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 939-945).—The yield of seed by Rhode Island colonial bent in a fertilizer experiment at the Rhode

Island Experiment Station was influenced chiefly by the amount of nitrogen applied, phosphorus and potash having little effect, and there was an indication that yields were depressed with high applications of minerals without a corresponding application of nitrogen. Time of maturity and weight per bushel of seed did not vary appreciably between the various treatments. Liming had only a small tendency to increase seed yields. Some lodging occurred on plats receiving the high ratio of nitrogen.

The classification of the rices of Bihar and Orissa, K. RAM and C. V. S. CHETTY (*Indian Jour. Agr. Sci.*, 4 (1934), No. 4, pp. 618-641).—The 123 types of rice embraced in this classification are separated on the basis of the chemical constitution of the kernel, presence or absence of clustering in spikelets, double-grained spikelets, and of elongated internodes with production of aerial roots at nodes length of outer glume, and color of inner glume, apiculus, and outer glume. Thereafter the color of kernel and internode and finally the grain size and shape are used in separating the ultimate classes. Previous classifications are reviewed.

The development of pigments in the glumes and apiculus of rice varieties, K. RAM and C. V. S. CHETTY (*Indian Jour. Agr. Sci.*, 4 (1934), No. 4, pp. 642-655, pls. 2).—The course of development of the colors straw, ripening straw, ripening gold, olive, gold, brown, purple, and ripening black was traced in several of the types described above from the first appearance of color when the panicle was yet in the boot until maturity.

Fertilizer studies with sugar beets in the Arkansas Valley area, Colo., 1921-28, L. A. HURST and A. W. SKUDERNA (*U. S. Dept. Agr. Circ.* 319 (1934), pp. 20, fig. 1).—Tests with commercial fertilizers on sugar beets grown on different soil types in the Arkansas Valley area dealt with fertilizer combinations, plant food sources, and rates of application.

Phosphorus seemed to be most needed by the sugar beet, supplemented by nitrogen on the lighter textured soils, for best results. The 4-16-0 and 4-12-4 mixtures produced largest beet yields on the fine sandy loam soils, the 4-16-0 and 4-16-4 mixtures gave best results on silt loam and loam types, and the 0-20-0 and 0-16-4 mixtures produced the largest tonnage of beets on the clay and clay loam soils. The nitrogen in the mixture evidently should be derived from both organic and inorganic materials. The phosphorus required may be supplied either by superphosphate or by treble superphosphate to which lime may be added as a filler if necessary. The efficiency of commercial fertilizer was increased by an abundance of organic matter in the soil. Tests with mixtures indicated that more of the needed plant food could be applied profitably in fields of high fertility than in fields poor in fertility. In general, from 25 to 50 lb. of plant food per acre of the fertilizer needed will suffice for sugar beets on soils of average fertility, while for more fertile soils a reasonable increase in yield can be expected from the rate of 60 to 80 lb. of plant food per acre. Indications were that commercial fertilizers at the recommended rates could safely be applied with the seed, provided such applications are promptly followed by furrow irrigation.

A chemical study of sugar beet during the first growth year, F. KNOWLES, J. E. WATKIN, and F. W. F. HENDRY (*Jour. Agr. Sci. [England]*, 24 (1934), No. 3, pp. 368-378, fig. 1).—The weights and composition of the sugar beet plant and plant parts were determined from 64 plant-samples of field-grown Kleinwanzleben E sugar beets lifted at each of eight growth stages from just before singling until maturity.

The leaves at about singling contained 90 percent of the dry matter and 76 percent of the sugars of the plant and 28 and 3 percent, respectively,

at maturity. The percentages of reducing sugars in the dry substance of the whole plant and of sucrose in the leaves maintained a steady level throughout. The highest percentages of sugars in dry matter of both leaves and roots were attained by early August. It was evident that although in the plant as a whole carbon assimilation proceeded faster than the intake of soil nutrients, until early July the rate of translocation of carbon to the roots did not equal their rate of intake of soil nutrients. Assimilation of phosphoric acid, lime, and chlorine ceased a month before maturity, whereas that of nitrogen and potash proceeded until the end. A marked contrast in the rate of assimilation of nitrogen and phosphoric acid was observed, and the dependence of the plant on available nitrogen was indicated. Considerable losses of phosphoric acid and chlorine were observed during the last month of growth from both leaves and roots. A large and constant proportion of the total chlorine, 92 percent, was contained in the leaves.

The Puerto Rico sugar manual, including data on Hispaniola mills, A. B. GILMORE (*New Orleans: A. B. Gilmore, 1934, pp. 238, figs. 27*).—Information is presented on the ownership, equipment, operation, sugar production, and agricultural conditions for various centrals in operation in Puerto Rico, the Dominican Republic, and Haiti, in 1934. The manual also includes papers on different phases of the cane-sugar industry presented at the 1933 meetings of the Association of Sugar Technologists of Puerto Rico and the Cuba Sugar Technologists Association and a number of special contributions.

The cause of bolting in swede turnips (*Brassica napus* var. *napobrassica* (L.) Peterm.), F. H. PETO (*Canad. Jour. Res., 11 (1934), No. 6, pp. 733-750, pl. 1, figs. 13*).—Plants of two varieties of swede turnips were grown in the greenhouse at the National Research Laboratories at Ottawa at high and low temperatures for different periods at various stages of their development. An initial growth temperature approximating 53° F. for 30 to 50 days induced incipient belting (premature seedstalk development) 71 days after planting as indicated by a rapid increase in internode length accompanied by retarded root development. Flowering was largely inhibited by growth temperatures above 65° in plants that had shown incipient bolting as a result of previous low temperature treatments. No plants grown continuously at high temperatures gave any indication of bolting. Conclusions were that high temperatures favor vegetative growth while low temperatures favor sexual reproduction.

Influence of spacing and time of planting on the yield and size of the Porto Rico sweetpotato, J. H. BEATTIE, V. R. BOSWELL, and E. E. HALL (*U. S. Dept. Agr. Circ. 327 (1934), pp. 11*).—Experiments at Florence, S. C., in cooperation with the South Carolina Experiment Station, wherein plants of Porto Rico sweetpotatoes were spaced 6, 9, 12, and 15 in. apart in 4-ft. rows, gave results indicating that plants could best be set about 12 to 15 in. apart in rows. Even though this wider spacing results in production of a higher percentage of jumbos, there is no loss of yield of the best market grade nor of total yield. A large proportion of the smaller sizes of roots, if desired for canning whole or for use as seedstock, can be attained by spacing at from 6 to 9 in. without loss of total yield or appreciable loss of No. 1. The yield of No. 1's and the proportion of oversized sweetpotatoes decreased consistently and the proportion of No. 2's increased as the planting date was delayed through the period May 15 to July 15. The greatest yield of No. 1 sweetpotatoes came from early plantings. Closer spacing was shown to be better than delayed planting to reduce the proportion of jumbos, since closer spacing

within proper limits did not reduce yields of marketable roots or the total yield.

Cigarette and cigar tobaccos: Relationship of production conditions to chemical and physical characteristics, W. W. GARNER, C. W. BACON, and J. D. BOWLING, JR. (*Indus. and Engin. Chem.*, 26 (1934), No. 9, pp. 970-974, figs. 3).—The chemical composition and the more important physical properties of flue-cured and Maryland cigarette tobaccos and Connecticut broadleaf binder and Pennsylvania seed leaf filler cigar tobaccos are presented, and their relationship to cultural methods and conditions are considered in this contribution from the U. S. D. A. Bureau of Plant Industry. The data were obtained in part in cooperation with the Maryland and North Carolina Experiment Stations and the North Carolina Department of Agriculture.

The marked difference in quantity of fertilizer nitrogen applied to the cigarette and the cigar types constitutes, according to the data presented, a highly significant factor in the sharp contrast existing between these two classes of tobacco in the nitrogen-carbohydrate ratio and associated differences in composition of leaf. Certain commercially important distinctions in properties or qualities in the two classes of leaf, including color, elasticity, grain development, aroma, and, in part, combustibility, are correlated with these differences in chemical composition.

The difference in soil types and details of culture employed in growing the crop are important factors in the less pronounced contrasts in properties existing between the cigar binder and cigar filler types, both high nitrogen products. In this instance contrasts in properties are not so clearly reflected in the organic constituents of the leaf, although significant differences exist in the composition of the ash. Both of the cigarette tobaccos have a high content of total carbohydrate, but the reason the Maryland type has an especially high content of pectin and cellulose instead of the high content of sugar and starch found in the flue-cured was not determined, although apparently a soil factor is involved. The method of curing commonly used materially influences the chemical and physical characteristics of the flue-cured type.

Structural responses to the practice of topping tobacco plants: A study of cell size, cell number, leaf size, and veinage of leaves at different levels on the stalk, G. S. AVERY, JR. (*Bot. Gaz.*, 96 (1934), No. 2, pp. 314-329, figs. 4).—In the tobacco plant vegetative growth usually ceases soon after seeds start to form, but if the terminal flower stalk and all axillary branches are removed by topping and suckering, respectively, as fast as they appear, the upper few leaves on the stalk continue to enlarge for some time. In a study with several varieties at Connecticut College, actually the upper third of the leaves on the stalk had a prolonged growth period in plants topped at the twenty-first leaf; and the seventeenth, nineteenth, and twenty-first leaves of such plants, compared with corresponding leaves of untopped plants, showed 32 percent greater average area and 29 percent greater average thickness. This increased growth of upper leaves of topped plants appeared due to a greater than usual increase in cell size. The palisade and upper and lower epidermal cells averaged 31 percent larger, whereas the fundamental tissue of the petiole did not increase in proportion to the blade tissues, its cells averaging only 23 percent larger. The only change in numbers of cells (in leaves 17, 19, 21) due to topping seemed to occur in the vascular tissue. Cambial activity resulted in an average of 47 percent more lignified xylem elements in the petiolar bundle. Differentiation of secondary phloem in the petiolar bundles of these leaves was negligible despite cambial activity. In the upper leaves of topped plants

fewer secondary phloem cells were noted in the petiolar bundles than in corresponding leaves of untopped plants. The degree of development of the xylem and the amount of water loss were closely interdependent. See also an earlier note (E. S. R., 70, p. 614).

Ethylene treatment of tobacco [trans. title], U. Rossi (*Bol. Tec. [R. Ist. Sper. Coltiv. Tabacchi, Scafati]*, 30 (1933), No. 4, pp. 221-258, pls. 12; *Fr. abs.*, pp. 257, 258).—Satisfactory results are reported from preliminary experiments wherein green leaves and whole plants and several varieties of tobacco were subjected under certain conditions to ethylene gas. The treatment markedly accelerated transformations occurring in the leaves during fire or air curing, and reduced the curing period about 40 percent. Ethylene seemed to stimulate enzymatic reactions by irritation of cellular plasma without changing the characteristic qualities of the tobacco. Aroma, color, and burn were improved, while elasticity was not affected. Ethylene treatment seemed to be useful with tobaccos hard to mature, slow ripening top leaves of certain oriental varieties, and tobacco poor in burn and aroma.

Growth of wheat during the heading period, V. H. FLORELL and B. FAULKNER (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 954-964, figs. 4).—Measurements were made daily of the increase in height of plants at the tip of the spike and the ligule of the upper leaf during the heading period of 18 varieties of winter and spring wheat grown at the Idaho Experiment Station in cooperation with the U. S. Department of Agriculture during 1931-33. The wheat culms elongated rapidly during the heading stage, the rate increasing with the temperature. The maximum daily elongation during the heading period of common and club varieties ranged from 4.3 to 9.1 cm. The average increase in the height of the culm after the tip of the spikes emerged above the ligule in common and club wheats was 30.6 percent of the final height of plants in 1931, 35.6 in 1932, and 39.4 percent in 1933. No significant varietal differences were observed except those clearly associated with final height. The culm continued to elongate for 5 to 12 days after the tip of the spike emerged above the ligule. No consistent relations were found between adaptation and increase in height after heading, final height, exertion of the spike, or type of growth curve. From 2 to 4 days were required for the spike to exert its full length from the boot in common wheats, 1 to 3 days in short-spiked club varieties, and nearly 4 days in the long-spiked White Polish wheat. Elongation of the culm continued as long as blossoming went on, but little or no growth occurred after blossoming was completed. The average blooming period for individual culms of the varieties ranged from 1 to 3 days in 1932 and from 3 to 6 days in 1933.

Recumbence in wheat as influenced by light and the soil surface, H. H. MCKINNEY and W. J. SANDO (*Jour. Heredity*, 25 (1934), No. 9, pp. 351-357, figs. 3).—Recumbence appeared to be a quantitative character in wheat and to be accentuated by bright sunlight and by short daily photoperiods near 8 hr. long. The light from Mazda "C" tungsten lamps and that transmitted through glass and cheesecloth shades reduced the degree of recumbence. Corex G980A glass favored recumbence more than any other glass tested, suggesting that recumbence is favored by the shorter wave lengths of light transmitted in greatest amount by this glass. Spring wheats, erect under ordinary field conditions, in some instances develop a considerable degree of recumbence in an 8-hr. day, indicating that some spring varieties carry one or more genetic factors for recumbence not detectable under ordinary culture. Since the horizontal soil surface prevents maximum downward bending of tillers in Rudy

wheat, the extreme genotype for tiller bending evidently cannot be obtained with plants as ordinarily grown.

The several degrees of recumbence expressed were not correlated consistently with the degree of earliness of varieties in the spring nursery, nor with the initial low-temperature requirements for earliness in winter wheats tested. The greatest degree of recumbence thus far has been observed among winter wheats midseason in earliness, although all midseason varieties are not equal in expression of recumbence in autumn.

Stem maggot injury among wheat varieties, R. S. DUNHAM (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 978-980).—Both Reward and Thatcher wheat appeared to be more susceptible to attacks of wheat stem maggot (*Meromyza americana* Fitch) in Minnesota Experiment Station studies than were Supreme, Ceres, or Hope wheats.

The effect of potassium supply on the composition and quality of wheat, A. G. McCALLA (*Canad. Jour. Res.*, 11 (1934), No. 6, pp. 687-700).—The amount of minerals absorbed by Marquis wheat plants grown at the University of Alberta and the time of absorption influenced the quantity of the grain produced. Quality was affected adversely by restriction of the potassium supply, and this effect could not be overcome by providing sodium in place of potassium. The quality of the grain produced by plants which had a small supply of potassium from germination until heading surpassed that of grain from plants which absorbed the same amount of potassium in the first month of growth but none thereafter.

The influence of environment on the carotenoid content of hard red spring wheat, A. G. O. WHITESIDE, J. EDGAR, and C. H. GOULDEN (*Cereal Chem.*, 11 (1934), No. 6, pp. 615-625, figs. 3).—Determinations on flours milled from a series of varieties of hard red winter wheat grown in 1933 on test plats in several localities in Manitoba, Saskatchewan, and Alberta revealed an appreciable effect of environment on the carotenoid pigmentation of flour. The effect of inherent characteristics was apparent in the tendency for varieties producing higher carotene values to be higher in kernel weight, lower in bushel weight, and higher in wheat protein. The study is held to demonstrate that carotenoid pigmentation is an inherent characteristic and to substantiate earlier conclusions of Whiteside that samples of the same variety may be expected to vary considerably in carotenoid content, and that the environmental conditions which tend to produce higher carotene values tend to produce lower bushel weight and lower kernel weight. No indication of a correlation between flour carotene and wheat protein due to environmental factors was noted in this series.

A simple method for determining the relative weight per bushel of the grain from individual wheat plants, O. S. AAMODT and J. H. TORRIE (*Canad. Jour. Res.*, 11 (1934), No. 5, pp. 589-593).—The size of kernels from individual wheat plants in studies at the University of Alberta on breeding for drought resistance varied so greatly that the usual measure of plumpness, weight per 1,000 kernels, was of little value. A method developed for determining the weight per measured bushel of small samples was found to have a very high degree of association with an estimated degree of kernel plumpness. The weight in grams of a 4-cc sample multiplied by 20 gave a close approximation to the test weight per bushel determined by the usual apparatus. The correlation coefficient calculated from the weight per bushel of 184 samples of spring wheat obtained by these two methods was $+0.947 \pm 0.005$ and for 59 samples of winter wheat $+0.834 \pm 0.027$.

Rules and requirements for the production of certified seed of approved field crop varieties (*New Jersey Stat. Circ. 337 (1934), pp. 4*).—The requirements for approved and certified seed, both bin and field standards, prepared in cooperation with the New Jersey Department of Agriculture, are outlined for wheat, oats, barley, rye, corn, soybeans, alfalfa, clover, and timothy.

Rhus toxicodendron (poison ivy), W. J. STONEBACK (*Amer. Jour. Pharm., 106 (1934), No. 10, pp. 374-381, figs. 7*).—A botanical description is given, prophylactic and remedial measures are outlined, and the nature and location of the toxic principle in the tissues are discussed. Photomicrographs show the histologic situation.

Poison ivy, G. P. VAN ESELTINE (*New York State Sta. Circ. 154 (1934), pp. 4, figs. 2*).—Poison-ivy, a widely spread weed in New York, is described briefly, treatments for ivy poisoning are indicated, and methods for eradication by grubbing or sprays of salt solution or old crankcase oil are outlined.

HORTICULTURE

[Research with horticultural crops], W. W. STOCKBERGER, C. E. LEIGHTY, E. C. AUCHTER, and B. Y. MORRISON (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1934, pp. 7, 8, 11, 12, 13, 14, 15, 16, 18*).—Brief reports are presented upon studies in the development of safflower as a source of drying oil; lavender and rose perfume production; shelter belt trees for the Great Plains; factors influencing biennial bearing in apples; value of etiolation in propagating apple cuttings; immunity of the Shalil peach to nematodes; testing of peaches for preserving and canning; role of moisture in Oregon pear orchards; ripening of Kieffer pears; the picking of grapefruits; coloring of Satsuma oranges; borax treatment of citrus to prevent decay; strawberry breeding; protection of fruit shipments from freezing; removal of spray residues from apples and pears; grafting of pecans; pollination of Persian walnuts; preservation of onion seed; breeding of lilies; forcing of spring bulbs; culture of plants with potential rubber-producing possibilities; and blueberry breeding.

[Horticultural studies] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1934, pp. 91, 92*).—A brief account is given of studies of strawberry varieties, the influence of light on the germination of moistened lettuce seed, and the effects of fruit thinning of apples, peaches, and oranges on the size and quality of fruits and on the fruiting habit of the trees.

[Horticulture at the California Station] (*California Sta. [Bien.] Rpt. 1933-34, pp. 33-39, 50-58, 62, 63, 64, 65-71, 72, 73, 74-77, pls. 6*).—Among research activities for which data are given are the breeding of mildew-resistant cantaloups; wilt-resistant watermelons; insect- and disease-resistant onions; and better types of asparagus, tomatoes, celery, carrots, garlic, beans, snapdragons, nasturtiums, and other plants. Citrus investigations include studies of new spraying materials, irrigation requirements, fertilizer needs, fruit thinning, and rootstocks. In addition there are reviewed studies with figs and persimmons; almond breeding; peach breeding; fruit thinning; control of fruit gumming of the peach; fertilizing, irrigating, and cover cropping of deciduous fruit orchards; relations of environment and rootstocks to the shape of Bartlett pears; control of crinkle leaf in cherries; pollination of the sweet cherry; resistance of peach and nectarine seedlings to nematodes; precooling and storing of deciduous fruits; testing of grape varieties; treatment of frosted vines; and control of cane failure in Youngberries.

[Horticulture at the New York State Station] (*New York State Sta. Rpt. 1934, pp. 31, 35, 36, 53-56, 57-60, 61-70*).—Among studies briefly discussed are

those dealing with the testing of vegetable seeds for viability and purity; the hot water treatment of cabbage seed; spreading and other qualities of insecticides and fungicides; spray residues on various fruits and vegetables; the breeding of fruits; variety testing of fruits; metaxenia in the apple; cytology of the apple; grape production in the Chautauqua region; fertilizer, cover crop, and varietal work with fruits in the Hudson River Valley; different nitrogen carriers in the Baldwin orchard; organic matter in apple orchards; legume cover crops for orchards; physiology of the development of peach and cherry seeds; artificial culture of fruit embryos; development of the fruit in relation to the embryo and seed; vegetative propagation of understocks; winter injury of nursery stock; growth of apples and pears on various understocks; mazzard v. mahaleb understocks; stock and scion relationships; training of fruit trees; transplanting dormant rose buds; propagation of raspberries by leaf bud cuttings; rotation and fertilizer experiments with vegetable canning crops; fertilizing of tomato seedlings; cultural studies with peas; hybrid sweet corns; relation of variety of pumpkin and squash to the character of the canned product; factors affecting quality of sweet corn; vegetables for quick freezing; and description and classification of vegetables, particularly cultivated forms of the genus *Cucurbita*.

[**Horticulture at the West Virginia Station**] (*West Virginia Sta. Bul.* 263 (1934), pp. 12-16, 18, figs. 3).—Brief reports are presented on the training and pruning of young Delicious apple and Montmorency cherry trees, the selection of understocks for apple and cherry, the causes of fruit splitting in the Stayman Winesap apple, the nature and causes of coloring in the apple, the proper time for picking Montmorency cherries, comparative resistance of different peaches to fruit bud killing, varietal trials with vegetables and fruits, and cultural and fertilizer tests with fruits.

[**Horticultural experiments in Wyoming**] (*Wyoming Sta. Rpt.* 1934, pp. 32, 36, 41).—Brief mention is made of cabbage irrigation and shelter belt trials at the Gillette Substation, and of vegetable variety tests at the Archer and Torrington Substations.

Spray residues are studied at Geneva, G. W. PEARCE (*Farm Res.* [New York State Sta.], 1 (1935), No. 2, p. 7).—Almost 3,000 samples of fruits and vegetables have been analyzed by the station since tolerances for arsenic, lead, and fluorine have been established. Various experiments were conducted to determine practical methods of cleansing farm products of toxic materials. A 1 percent hydrochloric acid solution used in a fruit washing machine gave good results with apples, and cherries and currants were also successfully cleansed with dilute hydrochloric acid. In the case of cauliflowers the use of derris powder instead of calcium arsenate is suggested as a means of controlling worms without building up undesirable toxic residues.

Analyses of materials sold as insecticides and fungicides during 1934, C. S. CATHCART and R. L. WILLIS (*New Jersey Stat. Bul.* 577 (1934), pp. 14).—Herein are presented in the customary manner (E. S. R., 70, p. 616) the results of analyses of materials collected during the inspection of 1934.

Hybrid inbred corn is proving superior, C. B. SAYRE (*Farm Res.* [New York State Sta.], 1 (1935), No. 2, pp. 4, 10).—Comparisons between new hybrid types of sweet corn and standard commercial varieties showed the former to be superior in yield, the proportion of fancy ears, and in a longer period during which the corn remained in excellent condition. The outstanding hybrid inbred variety was Golden Cross Bantam, a midsummer corn of exceptional quality and markedly resistant to Stewart's disease.

Seasonal variation in oxidation-reduction potential of some orchard soils, L. P. BATJER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 98-101, fig. 1).—Measurements of the redox potential on the B₁ horizon under high- and low-yielding trees in the Cornell University orchard and in a commercial orchard at Hall showed that as the season advances and air replaces some of the excess water in the soil the E_h values rise rapidly, and differences between soils become less. However, the differences remained significant until June 12 at Ithaca and July 7 at Hall, suggesting that the redox measurements are a useful index to drainage conditions long after normal aeration has been restored. The author suggests that the redox potential measurement may be of considerable value in determining the worth of a soil for orchard purposes.

Root penetration of nine mature fruit trees on heavy silt loam soils, E. R. CLARK ([Oklahoma] *Panhandle Sta., Panhandle Bul.* 55 (1934), pp. 13-16).—Observations on apple and apricot roots excavated in March and April 1934, showed the roots to be definitely limited to the upper 27 in. by a compact calcareous clay, which prevented moisture penetration. Apricot had a higher percentage of roots in the first foot and a larger proportion of small roots than did the apple. Delicious apple roots penetrated the clay more effectively than did either Jonathan or apricots. The necessity of wide spacing of fruit trees under the dry environment was indicated.

Pollination experiments with apples and pears [trans. title], F. KOEBEL and P. STEINEGGER (*Landw. Jahrb. Schweiz*, 48 (1934), No. 7, pp. 741-768, fig. 1; *Fr. abs.*, pp. 766, 767).—In presenting the results of pollination trials with a large number of apple and pear varieties at Wädenswil, Switzerland, there are listed certain combinations which were found intersterile, including William Christbirne (Bartlett) × Gute Luise von Avranches.

Yield relationships on terminal growths in York Imperial apples, F. W. HOFMANN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 299-302).—In studies carried on by the Virginia Experiment Station with York Imperial trees 18 yr. old in 1929, positive correlations were established between length and diameter of the preceding year's terminal growth and production. Between linear extension on terminal growth in a given season and yield on individual terminals and between the diameter of such linear extensions and yield, the correlation coefficients were for the most part significantly positive. The correlations between length of terminal growth of one season and average size of fruit on the same growth were generally negative and in certain years statistically significant. Apparently the longer growths tended to produce more apples with chances of smaller individual size. The author suggests that growth responses may be utilized as indications of yield potentialities.

Effect of defoliation on spur leaf area in the McIntosh apple, W. H. THIES (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 309-312).—The removal at the Massachusetts Experiment Station of the blossom buds from selected branches of 12-year-old McIntosh apple trees 11 days before full bloom resulted in an increase in spur leaf area of from 41 to 54 percent at the time of full bloom. Two weeks later the increase in leaf area for defoliated spurs was again evident in all except one case. Collections of July 4 showed the same trend but to a diminished degree, suggesting the approach of a balance at the close of the season. The advisability of removing a large percentage of the blooms in the full crop season is discussed, with the comment that no practical means of accomplishment is available.

Carbon dioxide assimilation of Baldwin leaves on different sides of the tree, E. P. CHRISTOPHER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 322-325).—Using the Heinicke and Hoffman apparatus (*E. S. R.*, 68, p. 744), observations

were made at Cornell University upon the comparative photosynthetic activity of leaves on vigorous spurs on the several sides of a mature Baldwin apple tree. The leaves on the east side assimilated approximately twice as much carbon dioxide during the morning hours as those on the west. With an illuminometer there were recorded striking differences in the relative amount of light reaching the different leaves, those to the east having the higher intensities. Since water is usually more abundant and the stomata are probably open for a longer time in the morning, it is conjectured that the leaves exposed to the morning sun are in a better position to take fullest advantage of available light.

Carbon dioxide assimilation by apple leaves as affected by lime-sulphur sprays.—II, **Field experiments**, M. B. HOFFMAN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 169-175).—Following previously reported greenhouse studies (E. S. R., 70, p. 778), the author observed the effect of spraying on the carbon dioxide intake of leaves of 6-year-old Northern Spy, Cortland, and McIntosh trees located in the Cornell University orchard. In general the results conformed with those secured in the greenhouse; that is, lime-sulfur sprays materially decreased the assimilation of carbon dioxide. The greatest reduction occurred the first day after spraying but was manifest for the 7 days the readings were continued. There was apparently a greater reduction in the Northern Spy than in Cortland. In the case of McIntosh leaves sprayed at 1:40 and 6:45 p. m. of the same day there was a greater reduction in carbon dioxide assimilation in the leaves sprayed at 1:40 p. m. A comparison of the effect of dry mix and standard lime-sulfur on Northern Spy leaves suggested that the dry mix has less inhibiting effect on the assimilation of carbon dioxide.

Carbohydrate storage in apple trees, A. E. MURNEEK (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 319-321).—Studies at the Missouri Experiment Station of entire 18-year-old Grimes Golden, Jonathan, and Delicious trees dug from October to December after bearing a normal crop showed a continuation of translocation of carbohydrates to the larger branches and roots. As unusually high starch and sugar content was found in the roots, indicating that the underground parts of the apple tree serve as storage organs for carbohydrates. Although weighing only one-third as much as the top, the roots contained nearly as much starch. It is suggested that from a practical standpoint apple trees should not be pruned until most of the carbohydrates have moved to the main limbs and roots.

Control of biennial bearing in apples, A. C. McCORMICK (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 326-329).—From 20-year-old Yellow Newtown and Ortley apples growing in the White Salmon Valley, Wash., and manifesting a strong tendency to biennial bearing, there were removed at blooming time two-thirds and three-fourths of the blossom clusters. Six weeks later at the regular time the treated trees and controls were all thinned to the same degree. Prethinning not only increased yields but stimulated ample fruit bud formation for the next year. On the average the control, the two-thirds, and the three-fourths blossom thinned trees produced 0.7, 36, and 56.3 percent of bloom the next spring. Prethinning, apparently through conserving of the tree's energy, permitted the formation of fruit buds instead of surplus fruit.

Fruit thinning and biennial bearing in Yellow Newtown apples, C. P. HARLEY, M. P. MASURE, and J. R. MAGNESS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 330, 331).—The adjustment on June 10, 39 days after blooming, of leaders to carry one fruit per 70 leaves resulted in a marked increase in blossoming spurs the next year, both as compared with 50 leaves per fruit and with

no treatment. However, when the adjustment was deferred until July 9 the 70-leaf group showed little, if any, superiority. It is conceived as probable that annual production on the leaders could be maintained with proper thinning.

Preliminary studies on the internal atmosphere of apples, O. J. DOWD (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 162, 163).—Analyses of gases collected from Rome Beauty apples harvested at different stages of maturity from the orchards of the University of Maryland showed a tendency for the percentage by volume of carbon dioxide to decrease during the growing period while that of oxygen gradually increased. The author believes that the higher percentage content of carbon dioxide in the early stages is associated with a higher respiration rate in the young fruits.

Chemical studies in the physiology of apples.—XV, The relation of carbon dioxide output to the loss of sugar and acid in Bramley's Seedling apples during storage, H. K. ARCHBOLD and A. M. BARTER (*Ann. Bot. [London]*, 48 (1934), No. 192, pp. 957-966).—Utilizing the half-apple method of technic (E. S. R., 72, p. 337), it was found that in any given storage period the loss of sugar and acid, expressed as carbon, from Bramley Seedling apples stored at 12° C. is from 17 to 30 percent greater than the carbon lost as carbon dioxide. Quarter apples gave satisfactory results provided the initial period of increased rate succeeding cutting was excluded. With diagonally opposite quarters the number of apples in a sample required to show a given degree of significance could be greatly reduced. The concentration of sugar in the apple was found greater on the blush side and to increase from the stem to the calyx end and from the core outward.

The storage behavior of apples as influenced by nitrogen fertilization and storage temperature, H. H. PLAGGE (*Iowa State Col. Jour. Sci.*, 9 (1934), No. 1, pp. 95-114, figs. 4).—Sodium nitrate applied to Grimes Golden and Jonathan apple trees in a highly productive orchard was found by the Iowa Experiment Station to increase consistently the nitrogen content of the fruit in each of the 3 yr. of the investigation. The increase was chiefly in the noncolloidal fraction. Nitrogen fertilizers apparently increased greatly the susceptibility of the two varieties to soggy breakdown in 1929, but in the dry years of 1930 and 1931, when little breakdown occurred normally, no significant effects were detected. No correlation was observed between nitrogen content at picking and susceptibility to breakdown. Noncolloidal nitrogen decreased during storage, especially at the higher temperatures of 48° to 50° F. Sugar content was generally reduced by nitrate fertilization. During storage reducing sugar values showed greater stability than did sucrose. Since the reducing sugar to noncolloidal nitrogen ratio was consistently higher in the unfertilized orchard, this ratio is considered an index to the resistance of apples to soggy breakdown. Ratios of sucrose to either the colloidal or noncolloidal nitrogen fractions could not be correlated with breakdown. A consistently higher alcohol insoluble residue in fruit of unfertilized trees suggests more cell wall differentiation and a reason for their better keeping qualities.

The effect of methods of packing on the condition of apples packed in barrels, P. L. HARDING, D. H. ROSE, and J. M. LUTZ (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 243-246, figs. 4).—Observations on Rome Beauty apples grown and packed in barrels at Hancock, Md., and subjected at Arlington, Va., to conditions approximating those in overseas shipments indicated that insufficient filling and racking are responsible for slackness in barreled stock. Shaking the barrels two or three times while filling was helpful. Overfilling caused much bruising and injury and did not replace adequate shaking and racking in preventing slackness. Refrigeration during transit prevented slackness in Jona-

than and Grimes Golden varieties subject to decay and breakdown. Racking the barrel five times increased the number of apples per barrel from 718 to 761.

The effect of ripe apples on the growth of certain seedlings [trans. title], H. KESSLER (*Landw. Jahrb. Schweiz*, 48 (1934), No. 7, pp. 853-861, figs. 7; *Fr. abs.*, p. 861).—A substance exuded by ripe apples, presumably ethylene, reacted unfavorably on the growth of the roots or stems, or both, of cucumber, oat, and buckwheat seedlings.

Pear fruit thinning in relation to yield and size of fruit for the same season, W. W. ALDRICH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 332-340, fig. 1).—Records taken on Anjou, Bartlett, and Winter Nelis pear trees fruit thinned to various fruit to leaf ratios showed heavy thinning to cut down total yields but to increase the percentage of larger pears. During certain periods of high air temperature Anjou and Winter Nelis fruits on the heavily thinned trees did not show as great reduction in growth rate as did the controls. Bartlett pears failed to show these differences. Determinations of the average increase in fruit volume per day per given leaf area showed a very definite decrease in leaf efficiency for fruit growth as the number of leaves per fruit was increased. Measurements of scaffold limb circumference in two Anjou plats showed somewhat greater increment in the 50-leaf per fruit than in the 35-leaf group, indicating that the increased nutrient supply was used in limb and shoot development.

The relationship of ripening temperatures to the rate of softening, texture, and flavor of Kieffer pears, J. M. LUTZ, C. W. CULPEPPER, and H. H. MOON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 229-232, figs. 5).—In pears obtained from Maryland, Virginia, Mississippi, Michigan, and New York and stored at various temperatures from 32° to 100° F., the most rapid softening occurred at 65°, followed closely by 60°. Where fruit was gathered at different intervals from the same tree, intermediate harvests had somewhat higher quality. Fruit ripened between 60° and 65° was of considerably better quality than that ripened above or below. Quality could not be associated with alcohol soluble or insoluble solids, total sugars, titratable acidity, or total astringency. The extraction of the internal gases of pears stored at different temperatures showed that at 70° there is a somewhat greater accumulation of carbon dioxide within the fruit. There was no sharp difference in carbon dioxide between 60° and 70°.

Growth of the peach embryo in relation to growth of fruit and season of ripening, H. B. TUKEY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 209-218, fig. 1).—Observations at the New York State Station on Greensboro, Triumph, Carman, Elberta, and Chili peach fruits gathered at 2-day intervals throughout their entire growing period showed that the changes from one period of development to another are abrupt and exact with a strikingly close similarity of certain portions of the curves for all five varieties regardless of the difference in season. The periods of embryo development tended to be constant except where abortion occurred. The pericarp growth periods differed widely for the several varieties, the earliest varieties having the shortest and the late varieties the longest periods of delayed development. The growth of the pericarp and of the nucellus and integuments was nearly parallel during the first stage of rapid pericarp development, except that the nucellus and integuments reached nearly maximum size while the pericarp did not. As the embryo began its most active growth, the nucellus, integuments, and pericarp slowed down.

Experiments on thinning peaches, J. S. SHOEMAKER (*Ohio Sta. Bul.* 541 (1934), pp. 33, figs. 4).—Based on experiments conducted with Elberta and 11

other varieties in 1931, with Elberta and 7 others in 1932, and with Carman in 1933, it is concluded that in a year of heavy production early thinning, near the middle of June, is desirable, not only for the current year but for its favorable effects on the succeeding crop. During the year of heavy fruiting all thinning treatments when averaged reduced total yields below the unthinned trees. Early thinning was less reducing than late thinning, the middle of July. Early thinning reduced the percentage of small peaches more than did late thinning. With all varieties the early-thinned trees outyielded the late-thinned in the second season.

From an economic standpoint early thinning is more expensive than late thinning, requiring nearly twice the time. On any given date thinning to 4 in. spacing was slightly more rapid than to 8 in. When the fruit set was heavy the receipts from Elberta were greater from early 8-in. thinning than early 4- or 6-in. thinning. The difference in returns was greater between early thinning and late or no thinning than between different spacings. Of several guide spacings, that involving the distance along the wood between two consecutive fruiting points on the same branch plus the distance measured along the wood and around the crotch to the nearest peach appeared most reliable.

In general conclusion the author asserts that thinning should be properly regarded as more than a 1-yr. proposition and should consider the fruiting performance of the preceding year.

Relation of pruning and thinning to fruit size and yield of Paloro peaches, F. N. HARMON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 219-222).—Observations by the U. S. Department of Agriculture at Shafter, Calif., on the response of vigorous young peach trees to different amounts of pruning showed that heavy pruning greatly reduced production, but on the other hand sharply stimulated shoot growth and total leaf area. All the pruned trees produced over twice as much total leaf area as the unpruned, due not to the number of leaves, which was less, but to the larger size. The largest amount of fruit was produced by the medium-pruned trees. The largest fruits were produced on the severely-pruned trees, but those receiving medium light pruning and thinning produced about 60 percent more fruits of good commercial size than did heavily pruned comparable trees. The possibility of adjusting a proper balance between growth and production by pruning is suggested.

Methods of protecting trees from winter injury, W. I. WHITE, F. HORSFALL, JR., and T. J. TALBERT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 355, 356).—The spraying of Elberta peach trees with a rosin emulsion prepared by adding sodium resinate to powdered rosin was found by the Missouri Experiment Station, when followed with a dusting of asbestos fiber, to reduce the killing of fruit buds. In a series of nine separate trials in which a total of 2,200 Elberta buds on cut twigs were frozen, about half of which were emulsion-asbestos covered, 22.9 percent of the controls and 23.2 percent of the asbestos-covered buds were uninjured. It is believed that the beneficial effects from applied asbestos lie in a retardation of the breaking of the rest period.

Apricot varieties, F. M. COE (*Utah Sta. Bul.* 251 (1934), pp. 60, figs. 18).—A comprehensive study of apricot varieties grown in the State revealed a great amount of confusion in varietal nomenclature. Accompanied by detailed descriptions of the more important varieties, an attempt is made to identify varieties and point out their more important characteristics. Most of the younger trees in Utah are said to be Large Early Montgamet, a variety of large size, attractive color, high quality, and with a sweet, edible kernel. The so-called Russian apricots, Superb, Gibb, Budd, and Stella, are declared worthless in Utah.

Growth study of the plum fruit.—I, The growth and changes in chemical composition of the Climax plum, O. LILLELAND (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 203-208, figs. 4).—At the California Experiment Station at Davis, Climax plums exhibited only slight periodicity in growth rate as compared with Royal apricot, Elberta peach, and Lambert cherry. An increase in weight or volume is considered a more desirable criterion than diameter data for ascertaining the period of final swell in the Climax plum. An examination following harvest showed the growth curve of fruits with aborted kernels to be practically identical with that of well developed seeds. Observations on the development of the pericarp, kernel, and endocarp showed the endocarp to be formed first and to make its growth chiefly during the second period. The accelerated growth of flesh was practically confined to the third period, and the kernel also exhibited accelerated increment in dry matter during the final period. The rate of gain in carbohydrates by the fruits was by far the largest in the final or third period. The relatively late occurrence of rapid growth is suggested as a reason why late thinning is satisfactory.

A fruit survey in Romic Switzerland: Prunes, 1931-1933 [trans. title], H. FAES and P. AUBERT (*Landw. Jahrb. Schweiz*, 48 (1934), No. 7, pp. 795-841, figs. 7; *Ger. abs.*, p. 839).—Varieties are described and classified according to their capacity to thrive at different altitudes. Many locally developed varieties were discovered, a few of which showed value for propagation.

The carbohydrates of dried California French prunes (prune D'Agén), E. MRAK, C. SMITH, and V. HENRIQUES (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 238-242).—Analyses at the California Experiment Station of the flesh of dried prunes from different districts showed that environment plays a role in composition. The dextrose to levulose ratio was less than 2:1 in fruit from the cooler Santa Clara and Napa districts and greater than 2:1 in fruits from the warmer Sacramento and San Joaquin areas. Hemicelluloses or pentose sugars and pentosans apparently formed a large part of the unreported carbohydrate fraction of prunes, while dextrans occurred only in negligible quantities. Pectin, lignin, and cellulose were found in appreciable quantities, and apparently much of these materials is destroyed in the process of determining crude fiber.

Studies of the response of the Latham raspberry to pruning treatment, W. G. BRIERLEY (*Minnesota Sta. Tech. Bul.* 100 (1934), pp. 30, figs. 11).—This further contribution (*E. S. R.*, 67, p. 39; 70, p. 626) upon the pruning of the red raspberry is presented in two parts, (1) Some Effects of Pruning upon Growth of the Latham Raspberry, and (2) Some Effects of Pruning Treatment Upon the Food Substances in the Fruiting Cane.

Severe spring tipping of the fruiting canes tended to the production of an increased number of laterals at any given height in the cane and tended in a lesser degree to decrease the mean length of the laterals on the lower portions of severely pruned canes. There was some indication that severe pruning has an inhibiting effect on growth. A small percentage of nodes were observed to produce two laterals and a few three, and severely pruned canes tended to produce more of these multiple laterals. In only two cases were twin laterals equal in vigor to the adjacent solitary laterals. Behavior in the hot, dry summer of 1933 suggested that moisture may be even more important than pruning in determining growth response. Other factors, such as food supply, light exposure, number of canes per hill, and insect injury are believed to mask frequently the effects of pruning.

Chemical analyses of samples of canes collected in the dormant season showed an increase in percentage content of dry matter, reducing sugars, total sugars,

total reserve carbohydrates, total organic nitrogen, and ash from the base upward. There was no effect of height on amino nitrogen, and the percentage of water declined toward the upper portion of the canes. It reached a maximum at the time of blooming and declined thereafter until the death of the canes. The nature of the pruning had only a minor effect on the moisture content. Except for a notable minor rise following fruiting, due apparently to phloem breakdown, the percentage of total sugars declined in both canes and laterals throughout the season. Reducing sugars paralleled total sugars, and in both the severity of pruning had little effect on percentage content. Starch increased slightly from dormancy to budding and then declined, with a slight rise as in the sugars immediately after fruiting. The percentage of total nitrogen declined rather regularly from dormancy to death. Amino nitrogen rose slightly to the budding season and then declined until death. The pruning effects on stored foods were quantitative.

Raspberry growing in New York, G. L. SLATE and W. H. RANKIN (*New York State Sta. Circ.* 153 (1934), pp. 50, figs. 9).—In presenting this comprehensive discussion of varieties, culture, pruning, harvesting, and marketing, and the control of pests, particular attention is paid to several mosaic diseases—their symptoms, effects, and methods of prevention and control. Latham was found to be resistant to mosaic diseases, and the new station seedling Newburgh to possess strong mosaic-escaping properties.

Responses of strawberry varieties and species to duration of the daily light period, G. M. DARROW and G. F. WALDO (*U. S. Dept. Agr., Tech. Bul.* 453 (1934), pp. 32, figs. 12).—Studies conducted in the greenhouse and field with various species and varieties of strawberries indicated that the different forms possess for the most part rather sharply limited day length requirements, both for vegetative development and for fruiting. The response of varieties to light conditions in the greenhouse in October, November, and December was found useful in determining their regional adaptation. Missionary, a popular variety in Florida, produced runners freely in a 12-hr. day, a condition unfavorable to the usual northern-type variety, such as Howard 17. Everbearers, such as Progressive, were found to require long days to produce blossom buds. Spring fruiting varieties tended to produce fruit buds in autumn when the day length becomes too short for runner development.

The rest period in the strawberry is believed dependent on a short-day, low-temperature complex and may be partly broken in certain varieties by additional light, and in all varieties by temperatures below 0° C. Over 80 varieties and species brought into the greenhouse before being permitted a full rest period continued flowering and fruiting until the following midsummer. Varieties and their parental species are considered to have characteristic temperature-day-length responses which determine their regional adaptability.

The culture and handling of the Blakemore strawberry, G. M. DARROW and C. DEARING (*N. C. Dept. Agr. Bul.*, 1934, Nov., pp. 30, figs. 19).—Prepared cooperatively by the U. S. Department of Agriculture and the North Carolina Department of Agriculture, this paper discusses the origin of the variety, its regional adaptability, characteristics, methods of culture, harvesting, marketing, etc.

In a comparison of six systems of growing, (1) 24-in. rows spaced 9 in., (2) 24-in. rows spaced 6 in., (3) double-hill row, early, (4) double-hill row, late, (5) 30-in. matted row, and (6) 12-in. matted row, the total yields obtained per acre were 4,993, 4,760, 3,506, 3,004, 2,331, and 2,098 qt. The largest berries, based on six pickings, were produced by the double-hill row, early system of culture, and the smallest berries by the 30-in. matted row. The percentage of

decaying berries after 1 day's holding of the May 19 picking was lowest (5 percent) in the double-hill, early lot and greatest (26 percent) in the 30-in. matted row. It is concluded that in the Blakemore variety larger crops of superior grade may be secured by spacing the runner plants rather than simply allowing them to mat at random.

Nutrition of strawberry plant under controlled conditions: (a) Effects of deficiencies of boron and certain other elements, (b) susceptibility to injury from sodium salts, D. R. HOAGLAND and W. C. SNYDER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 288-294, figs. 5).—Striking malnutrition symptoms observed in strawberry plants growing at the California Experiment Station, in cultural solutions containing KNO_3 , $\text{Ca}(\text{NO}_3)_2$, MgSO_4 , KH_2PO_4 , and iron tartrate were not appreciably changed by the addition of Mn nor entirely removed when B was also supplied. However, when a general supplementary solution containing many different elements was added the plants made excellent growth, indicating that Cu or Zn, or both, and perhaps other elements are required by the strawberry for its best development. A concentration of B of approximately 0.1 p. p. m. prevented B deficiency symptoms in spring but not in summer. Of three varieties, Banner, Nick Ohmer, and Klondike, the last was least susceptible to nutrient deficiencies, particularly B. The use of the water culture method to study susceptibility to injury from Na salts indicated that Nick Ohmer is highly sensitive to even moderate concentrations of either Na_2SO_4 or NaCl. Na_2CO_3 caused marked root necrosis but less leaf scorch.

Strawberry "black root" injury, R. H. ROBERTS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 295, 296, fig. 1).—At the Wisconsin Experiment Station Dunlap plants exposed without protective mulch to 7° F. on November 19 showed root discoloration to the extent of 3.6, 13.6, 50.6, and 94.8 percent on large, medium, small, and very young plants, respectively. At the same time plants mulched before 20° F. was reached showed no clear-cut injury. Premier (Howard 17) exhibited more injury than did Dunlap. Isolations by G. W. Keitt revealed as many as 18 to 20 fungi present, but these appeared also on control and uninjured roots almost as often.

Effects of fertilizer on the native Maine blueberry, F. B. CHANDLER and I. C. MASON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 297, 298).—The application by the Maine Experiment Station of various fertilizing materials to native low-bush blueberries in the spring 1 yr. before burning indicated that N was the most effective element. Increased yields were secured on the N plats at all three harvests and for two harvests on the P and K plats. On some plats fertilizer stimulated weeds to a harmful extent. As determined by analyses, all fertilizer treatments tended to decrease reducing sugars in the fruit and induce minor changes in nonreducing sugars and N. Grading studies showed very little difference in size of berries due to fertilizers.

Anatomy of aerial roots of *Vitis rotundifolia*, L. M. TURNER (*Bot. Gaz.*, 96 (1934), No. 2, pp. 367-371, figs. 5).—The results are presented of a histological study at the University of Arkansas of aerial roots, which originate usually on the lower side of the horizontal or oblique canes about 1 in. or more in diameter. The author believes that the root primordia must arise in the phloem parenchyma.

The treatment of frosted grape vines, A. J. WINKLER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 253-257).—Observations in Merced and San Joaquin Counties, Calif., following spring frosts suggested that the treatment of frosted vines should be governed by the fruiting habits of the variety and by the degree of injury. In Sultanina (Thompson Seedless), Sultanana, and possibly Emperor, where only the primary growing point of the dormant bud is usually

fruitful, pruning treatments of frosted shoots were generally of no avail. In Malaga (Almeria) and varieties of similar habit, where frequently one lateral growing point of the dormant bud is fruitful as well as the primary growing point, removal of injured shoots unless entirely killed should prove beneficial. Tokay and other varieties with two or more fruitful growing points in the dormant bud produce almost a full crop when the shoots are entirely killed or when the unfrosted remnants are removed so as to force lateral growth.

The effect of sulphur dioxide fumigation on the respiration of Emperor grapes. W. T. PENTZER, C. E. ASBURY, and K. C. HAMNER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 258-260).—Determinations of the respiration rates of Emperor grapes held at 32°, 36°, 43°, and 53° F. after fumigation with SO₂ indicated that respiration was reduced by the treatment. As little as 12 p. p. m. of SO₂ in the tissues reduced the respiration rate 18 to 26 percent as compared with untreated fruits. At 12 and 22 p. p. m. there was no evidence of injury to the fruit. Although the chief value of SO₂ fumigation is said to lie in the effect on molds, the authors state that the reduced loss of stored carbohydrates should be beneficial.

Anomalous fig trees. I. J. CONDIT (*Jour. Heredity*, 25 (1934), No. 12, pp. 496, 497, fig. 1).—In a block of some 3,000 seedling figs growing at the Citrus Experiment Station, Riverside, Calif., there were observed two trees, one of which, a cross between Kassaba and the Excelsior caprifig, had one main limb bearing receptacles with short-styled flowers and the other three limbs with receptacles with long-styled flowers. The second tree, a cross between Kadota and a *Ficus palmata* caprifig, had three branches bearing short-styled caprifigs and one branch bearing long-styled edible figs. In both cases the single variant branch may be considered a bud sport.

Some observations on the behavior of cured ripe Mission olives preserved at low temperatures. H. C. DIEHL and J. A. BERRY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 233-237, figs. 2).—Studies made of cured ripe olives packed both with and without weak salt brine in airtight and nonairtight packages and held for 10 mo. at air temperatures of -5°, 15°, 20°, 25°, and 32° F. indicated that the two highest temperatures are inadequate to prevent slow microbial spoilage, irrespective of the type of pack. It is asserted that 20° must be accepted as the highest possible temperature for freezing preservation of olives, and that even at 20° airtight containers are essential. Ice crystals forming in olives at low temperatures left cavities upon thawing which tended to softness. A wrinkling of the skin following freezing appeared to be influenced by the type of ice formation in the flesh as well as the presence or absence of a liquid medium. At 25° and 32° ripe olives in airtight containers bleached slowly but regained much of their color upon thawing in air.

What research has done for subtropical agriculture: Achievements of the Citrus Experiment Station. H. J. WEBBER (*California Sta.*, 1934, pp. 28, pls. 5).—In discussing the achievements of the Citrus Experiment Station established at Riverside in 1913, the author, director somewhat more than the first 14 years and still actively participating in the station's work, presents a review of experimental activities during the first two decades and points out the important bearing of the results on the horticulture of southern California.

Among subjects covered are soil improvement and irrigation, alkali control, the role of boron and other nutrients, varieties and breeding, citrus rootstocks, control of citrus diseases and injuries, control of date diseases, date culture, control of avocado and walnut diseases, disease resistance in citrus, insect life history and control, and the biological control of various insect pests.

Resistance to low winter temperatures of subtropical fruit plants, R. W. HODGSON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 349-354).—A record is presented of the injuries experienced by many different species and varieties of plants. From a disastrous December freeze which followed a November of exceptional warmth, factors influencing the degree of injury were the state of dormancy, nutritional conditions of the plant, the depth of soil, moisture in the soil, and exposure to the strong winds that accompanied the freeze.

The distribution of total nitrogen in the orange tree, S. H. CAMERON and D. APPLEMAN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 341-348, figs. 2).—Analyses by the University of California of immature and mature entire Valencia trees and of branches taken at frequent intervals throughout the year from trees fertilized with nitrogen showed marked seasonal fluctuations in nitrogen content. There were three distinct flushes of growth in the Valencia orange, at which time there occurred definite decreases in nitrogen content in the bark of the branches bearing the new growth. The most marked decrease occurred during the spring flush, the most vigorous of the three and accompanied by profuse blooming.

Excluding the leaves, which contained about 40 percent of the nitrogen of 10-year-old trees and about 60 percent of that in young trees, the above-ground portions contained as much as or more nitrogen than did the roots. On a percentage basis the roots, particularly the root bark, were richer in nitrogen than the above-ground wood and bark. It is conceded that the roots of the orange tree are not important nitrogen storage organs, and that such storage as occurs is largely in the leaves.

Variation in the size of Trinidad cacao beans and methods of its assessment, A. W. PATERSON and R. L. REED (*Trop. Agr. [Trinidad]*, 11 (1934), No. 10, pp. 252-261, figs. 3).—Measurements on cacao beans obtained from a planters' association showed that Trinidad cacao includes a wide range of bean sizes. In both the "Plantation" and "Superior" grades there was noted a correlation between length and mean breadth of the beans. Length was not correlated with thickness in the Plantation grade, but there was a slight negative association in the case of the Superior beans.

Fruit growth and temperature relationship in the date palm, D. W. ALBERT and R. H. HILGEMAN (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 225-228, figs. 2).—Weekly measurements taken by the Arizona Experiment Station on fruits of Hayany, Deglet Noor, and Maktoom dates growing near Tempe showed that during the period of fruit stalk development fruit growth is very slow, but that as elongation is completed the fruit grows rapidly. After full size was reached there was a slight shrinkage before final maturity. Winter temperatures had a direct influence on spathe development and time of bloom, and temperature after bloom had apparently more effect on the date of ripening than did the date of bloom. There were indications that extremely high temperatures in midsummer retard growth. Based on heat units above 50° F., the minimum for growth, Hayany required approximately 4,200 and Maktoom and Deglet Noor about 5,300 heat units from time of blooming until ripening began.

The feijoa, K. A. RYERSON (*Natl. Hort. Mag.*, 12 (1933), No. 3, pp. 240-245, figs. 3).—A brief account is given of varieties, botanical characters and relationships, climatic adaptation, etc.

Native nut trees can be improved, G. L. SLATE (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, pp. 6, 9).—Stating that superior individuals exist among the nut species just as in fruits, the author mentions certain named varieties of black walnuts, Persian walnuts, and filberts that are promising.

Bixby and Buchanan filberts, resulting from a cross between the American hazel and the European filbert, are said to be worthy of trial.

Notes on the status and nomenclature of the British elms, [I]—VII, H. BANCROFT (*Gard. Chron.*, 3. ser., 96 (1934), Nos. 2486, pp. 122, 123, fig. 1; 2487, pp. 139, 140, fig. 1; 2491, pp. 208, 209, fig. 1; 2493, p. 244; 2496, pp. 298, 299, fig. 1; 2498, pp. 334, 335, fig. 1; 2500, pp. 372, 373).—This study of the British elms indicated that the number of true species was limited, but that there is a wealth of hybrids and intermediate forms with badly confused nomenclature.

A preliminary report of the growth and effectiveness of windbreaks in the High Plains area of Oklahoma, E. R. CLARK ([*Oklahoma*] *Panhandle Sta.*, *Panhandle Bul.* 55 (1934), pp. 3–12, fig. 1).—Observations on windbreaks planted in 1928 around the station orchard and watered only at the time of setting indicated that Chinese elm, apricot, and Russian mulberry may be successfully grown in the Panhandle region. Osage orange and red cedar made slow progress, and all of the pines succumbed. In the fall of 1934 the elm, apricot, and mulberry trees averaged 11.6, 8.9, and 8 ft. in height, and wind-velocity measurements showed that the trees were effective in reducing the wind for a distance of 260 ft. Records in the various plats showed that soil moisture was an outstanding factor in tree behavior.

Treatment and care of tree wounds, J. F. COLLINS (*U. S. Dept. Agr., Farmers' Bul.* 1726 (1934), pp. II+38, figs. 24).—This is a revision of Farmers' Bulletin 1178 (*E. S. R.*, 44, p. 339).

FORESTRY

Report of the Forester, 1934, F. A. SILCOX (*U. S. Dept. Agr., Forest Serv. Rpt.*, 1934, pp. 50).—This administrative report contains information on State forestry legislation; forest protection from fire, insects, and fungi; the national forests; and research activities in forest economics as to tax delinquency, logging methods, and forest insurance, forest management as to selective cutting, reproduction, and fire control, erosion control, development and utilization of forest products, range management, etc.

Forest tree breeding [trans. title], W. v. WETTSTEIN-WESTERSHEIM and S. BEHRNDT (*Züchter*, 6 (1934), No. 11–12, pp. 296–299, figs. 5).—Measurements at the Kaiser Wilhelm Institute, Müncheberg, on 6-year-old trees of 16 *Pinus sylvestris* progenies revealed one progeny especially resistant to the fungus *Lophodermium pinastri*, averaging 43.6 cm taller than the average of all the progenies. Marked differences were noted in the characteristics of different races of *Picea excelsa* raised from seed obtained from different localities. The possibility of self-pollinating oaks was demonstrated.

Diametral changes in tree trunks, F. S. HAASIS (*Carnegie Inst. Wash. Pub.* 450 (1934), pp. [3]+103, pls. 4, figs. 31).—Asserting that diurnal shrinkage and nocturnal swelling in clear weather is the rule in practically all species that have been studied, the author states that weather causes pronounced modifications in the behavior of plants. For example, during rainy weather diurnal shrinkage may be obliterated. Shrinkage of trees may occur during dry periods of summer or autumn, during the dormant season, and during the period of leaf development in the spring. Increases in diameter of a plant stem may be due to growth or rehydration of previously dried tissues. Growth appears to depend on an adequate water supply and sufficient heat. In the Monterey pine a very large amount of the diurnal and seasonal fluctuations in moisture content occurs in a relatively thin layer near the cambium, whereas

in the coast live oak most of the changes occur in the thick bark. The time of beginning and cessation of growth also varied with the weather. An extensive bibliography is appended.

Diameter distributions for old-field loblolly pine stands in Maryland, G. L. SCHNUR (*Jour. Agr. Res. [U. S.], 49 (1934), No. 8, pp. 731-743, figs. 7*).—From repeated diameter measurements taken by the U. S. D. A. Forest Service in permanent sample plats established in 1906 in Worcester County, Md., there is constructed a stand probability chart, which is further simplified by transformation into the customary alinement chart form. Of five type curves, namely, Pearson's type 3; Charlier's type A; Charlier's type B, 2-term; Charlier's type B, 4-term; and Pearson's type 1, fitted to the data on average diameter distribution, the last was found to fit most perfectly. Consecutive measurements over a period of years on an arbitrarily selected plat were found to fit reasonably well. Comparisons of the distributions obtained from the chart with those published by the U. S. D. A. Forest Service in 1929 for loblolly pine indicated improved accuracy both in skewness for stands 12 in. in diameter or less and in important upper classes of diameter distributions.

Distribution of soil moisture under isolated forest trees, H. A. LUNT (*Jour. Agr. Res. [U. S.], 49 (1934), No. 8, pp. 695-703, figs. 4*).—Moisture determinations made by the Connecticut [New Haven] Experiment Station on samples of soil collected at different depths and different distances from the tree in trenches dug outward from the trunks of individual trees of *Pinus resinosa*, *P. strobus*, *P. nigra*, and *Quercus rubra* showed in practically all cases the lowest moisture content immediately below the crown close to the base of the tree. The highest moisture was usually at the 1-ft. level and increased outward toward the tips of the branches. Immediately below the crown only about 75 percent of the total precipitation reached the soil. Although the trees apparently obtained most of their nutrients from the upper foot, it was evident that, except in moist soils, the tree draws from the subsoil for moisture. The entire root system was thus apparently employed in moisture absorption.

List of publications on the growth, structure, and identification of wood (U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [1]+36).—This mimeographed list includes publications of general information and the results of research by the Forest Service on the structure and identification of wood; the effect of the cellular structure of wood on its strength, shrinkage, permeability, and other properties; the influence of environmental factors, such as light, soil, moisture, and fire, on the quality of wood produced; and secretions of economic value produced by trees and their exploitation.

DISEASES OF PLANTS

[Papers presented at the twenty-fourth annual meeting of the American Phytopathological Society, Atlantic City, N. J., December 28-30, 1932] (*Phytopathology*, 23 (1933), No. 1, pp. 4-40).—Included are abstracts of the following papers presented at this meeting: Heterothallism in *Puccinia graminis*, *P. coronata*, and *Melampsora lini*, by R. F. Allen (p. 4); Serologic Reaction as a Means of Determining the Concentration of Tobacco Mosaic Virus, by H. P. Beale (p. 4); A Fruit Spot Associated with the Papular Type of Apple Measles, by A. Berg (p. 4); Electrophoretic Studies on Purified Plant Viruses (pp. 4, 5) and Experiments on Acquired Immunity in Tobacco Mosaic and Spot Necrosis (p. 5), both by J. M. Birkeland; Total Amount of Copper Applied and Ratio of Lime to Copper in Bordeaux as Important Factors in

Potato Spraying, by F. M. Blodgett, E. O. Mader, O. D. Burke, and R. B. McCormack (p. 5); Development of Apple Scab on Stored Fruit, by C. O. Bratley (p. 5); Virus Diseases of Dahlia, by P. Brierley (p. 6); A Wilt of Strawberry Caused by *Colletotrichum fragariae*, by A. N. Brooks (p. 6); Relation of the Toxin Produced by *Bacterium tabacum* to the Pathogenicity and Host Range of This Organism, by E. E. Clayton (p. 6); A Mosaic of the Fig in California, by I. J. Condit and W. T. Horne (p. 7); Infection of Seed Clusters of Spinach by *Peronospora effusa*, by H. T. Cook (p. 7); Pineapple Leaf Spot, by M. T. Cook (p. 7); *Fusarium* Basal Rot of Bulbous Iris, by D. B. Creager (p. 7); Effect of Temperature on Brown Patch of Turf, by A. S. Dahl (p. 8); Snow Mold and Brown Patch Caused by *Sclerotium rhizodes*, by W. H. Davis (p. 8); Disease-Resistant Wheats Recently Introduced from Russia, by J. G. Dickson and R. G. Shands (pp. 8, 9); Nature of Resistance of Corn to Seeding Blight, by J. G. Dickson, K. P. Link, and A. D. Dickson (p. 9); Environment and Seed Treatment in Relation to Common Potato Scab, by B. J. Dipenaar (p. 9); Perfect Stage of *Sclerotium gladioli*, by F. L. Drayton (p. 9); Differentiation of Green and Yellow-Mosaic Viruses in Tobacco, by J. Dufrénoy (p. 10); *Nectria coccinea* on Beech, by J. Ehrlich (p. 10); Basal Glume Rot of Barley, by C. Elliott and A. G. Johnson (p. 10); Influence of Soil Moisture and Soil Temperature on Infection of Wheat by *Urocystis tritici*, by J. A. Faris (pp. 10, 11); Effect of Scab-Preventive Treatments on Apple-Tree Growth and Yield and Potato Tuber Rot Caused by *Botrytis cinerea*, both by D. Folsom (p. 11); *Cytospora* Canker of *Picea* spp., by C. J. Gilgut and O. C. Boyd (p. 11); Method of Estimating Loss in Yield from Cereal Diseases, by F. J. Greaney (p. 12); Production of a White Fertile Saltant of *Helminthosporium sativum* by Means of Ultraviolet Radiation, by F. J. Greaney and J. E. Machacek (p. 12); Control of *Alternaria dianthi* Causing a Serious Disease of the Carnation (p. 12) and Control of the Root-Knot Nematode in Greenhouses with Carbon Disulphide Emulsion (p. 13), both by E. F. Guba; Damage to Forest Products by Fungi, by C. Hartley (p. 13); A Brooming Disease of *Robinia pseudacacia* Transmitted by Grafts, by C. Hartley and L. W. R. Jackson (p. 13); Pure-Culture Technique for Quantitative Studies of Plant Growth in Association with Microorganisms and True Mycorrhizal Fungus in Contrast to *Mycelium radices atrovirens*, both by A. B. Hatch (p. 14); Seed-Borne Bacteria Main Cause of Pea Wilt, *Fusarium*, *Aphanomyces*, and Other Organisms Merely Subsidiary, by L. Heimbeck (p. 14); Increasing the Resistance of Tobacco Ring-Spot Virus to Aging in vitro by Use of Carbolic Acid, by R. G. Henderson (pp. 14, 15); Water Loss in Tomato Mosaic, by J. W. Heuberger and J. B. S. Norton (p. 15); Bound Water in Leaf Tissues of Heat-Resistant and Heat-Susceptible Inbred Strains of Yellow-Dent Corn, by J. R. Holbert and B. C. Frye (p. 15); Bacterial Leaf Blight of Dent Corn, by J. R. Holbert, C. Elliott, and B. Koehler (pp. 15, 16); Differences in Size and Shape of Smut Balls of Two Physiologic Forms of *Tilletia tritici* and Inheritance of Chlamydospore Characteristics in Oat-Smut Fungi, both by C. S. Holton (p. 16); Influence of Root Rot on Peas: March of the Disease, by J. G. Horsfall and Z. I. Kertesz (pp. 16, 17); Sclerotium Diseases of Grains and Grasses, by C. W. Hungerford and R. Remsburg (p. 17); Zinc Hydroxide, a Substitute for Calcium Hydroxide in Arsenical Sprays, by R. H. Hurt (p. 17); Peach Mosaic, by L. M. Hutchins (p. 17); Bacterial Wilt of Corn, by S. S. Ivanoff (p. 18); Effect of Sulphuric Acid and Aluminum Sulphate, as Used for the Control of Damping-off of Conifers, on soil pH and Effects of H-ion and Aluminum-ion Concentrations on Conifer Damping-off, both by L. W. R. Jackson (p. 18); Physiologic Forms of *Bremia lactucae* on Lettuce, by I. C.

Jagger and N. Chandler (pp. 18, 19); Nature of Injury Caused by Potato Leaf Hopper on Forage Legumes, by H. W. Johnson (p. 19); Effect of Leaf-Rust Infection on Water Economy and Growth of Two Wheat Varieties, by C. O. Johnson and E. C. Miller (pp. 19, 20); Two Stem Cankers of the China Aster, by L. R. Jones and R. S. Riker (p. 20); Seed Transmission of the Virus Causing Variegation of *Abutilon*, by J. Y. Keur (p. 20); Effect of Carbon Dioxide on Cultivated Mushrooms, by E. B. Lambert (p. 20); Life-History, Morphology, and Cytology of *Polymyxa graminis*, by G. A. Ledingham (pp. 20, 21); Bacterial Twig and Blossom Blight of Raspberry, by S. G. Lehman (p. 21); Crown Gall on Sahuaro (*Carnegiea gigantea*), by M. Levine (p. 21); Elm Diseases in America, by O. N. Liming (p. 21); Relation of Mechanical Injury to Foot Rot of Cereals, by J. E. Machacek and F. J. Greaney (p. 22); Effect of Pressure and Amounts of Copper Applied in Spraying Potatoes and Evidence of Stimulation of Potatoes by Bordeaux Mixture, both by E. O. Mader (p. 22); Diseases of Cultivated Sweet Violet Caused by *Sphaceloma*, by L. M. Massey, R. P. White, and A. E. Jenkins (pp. 22, 23); Form of Toxicity Surface for Copper Sulphate and for Sulphur in Relation to Conidia of *Sclerotinia americana*, by S. E. A. McCallan and F. Wilcoxon (p. 23); Spores in the Upper Air, by F. C. Meier, J. A. Stevenson, and V. K. Charles (p. 23); A *Pythium* Disease of Turf, by J. Monteith, Jr. (pp. 23, 24); An Undescribed Sclerotium Fungus Prevalent in Northeast Texas, by D. C. Neal and R. E. Wester (p. 24); Morphology and Life History of the Cotton-Root-Rot Fungus in Texas, by D. C. Neal, R. E. Wester, and K. C. Gunn (p. 24); Breeding *Fusarium*-Yellows-Resistant Celery, by R. Nelson and L. C. Cochran (p. 25); Influence of Pollen and Ovule Infection in Seed Transmission of Bean Mosaic, by R. Nelson and E. E. Down (p. 25); Studies on the Resistance of Wheat and Oats to Stem Rust, by M. Newton and A. M. Brown (p. 25); Stripe Rust in Canada, by M. Newton, T. Johnson, and A. M. Brown (pp. 25, 26); Factors Influencing Type and Sequence of Tomato-Mosaic Leaf Abnormalities, by J. B. S. Norton and J. W. Heuberger (p. 26); Reaction of Tissues from Individual Plants to Soft-Rot Bacteria, by C. R. Orton (p. 26); Serum-Agglutination Studies with Soft-Rot Bacteria, by C. R. Orton and A. R. Stanley (p. 27); A Bacterial Blight of the Broad Bean in Louisiana, by L. H. Person (p. 27); Dissemination of Fire-Blight Bacteria by Honeybees, by A. L. Pierstorff and H. Lamb (p. 27); Combating Spinach Damping-off by Seed Treatment, by P. P. Pirone (p. 28); Prevalence and Relations of 4 Soil-Borne Parasites on the Peach Trees in the Sand Hills of the Carolinas, by R. F. Poole (p. 28); A Complex Virosis of Tobacco, by H. M. Quanjer (p. 28); Fungicidal Efficiency of a Solution of Mercuric Chloride and Potassium Iodide (pp. 28, 29) and A Homemade Colloidal Copper Spray (p. 29), both by W. P. Raleigh; Seasonal Development of Hairy Root, Crown Gall, and Wound Overgrowth on Apple Trees in the Nursery, by A. J. Riker and E. M. Hildebrand (p. 29); *Fusarium* Strains in Relation to Wilt of China Aster, by R. S. Riker and L. R. Jones (pp. 29, 30); Control of Hairy Root, Crown Gall, and Other Malformations at the Unions of Piece-Root Grafted Apple Trees, by A. J. Riker, G. W. Keitt, E. M. Hildebrand, and W. M. Banfield (p. 30); The Genetics of *Sphacelotheca sorghi* and *S. cruenta*, by H. A. Rodenhiser (p. 30); Pathogenicity of Certain Hybrids of Covered and Loose Smuts of Sorghum, by H. A. Rodenhiser and B. F. Barnes (pp. 30, 31); Comparative Studies of Field Collections of *Ustilago hordei* and *U. nuda*, by M. L. Ruttle-Nebel (p. 31); Notes on Bordeaux Mixture, by G. E. Sanders (pp. 31, 32); A New Necrotic Virus Disease of Potatoes and Resistance of Potato to Latent Mosaic, both by E. S. Schultz and W. P. Raleigh (p. 32); Resistance of Rosaceous Plants to Fire Blight,

by L. Shaw (pp. 32, 33); Relation of Growth Cycle and Nutrition to Perennial Apple-Canker Infection, by E. V. Shear and J. S. Cooley (p. 33); Relationship of *Fusarium nivium* to the Formation of Tyloses in Melon Plants, by B. Sleeth (p. 33); Association of *Cercospora* Foot Rot with a Specific Ecological Area, by R. Sprague (pp. 33, 34); Distribution of Physiologic Forms of *Puccinia graminis tritici* in Relation to Stem-Rust Epidemiology in 1932, by E. C. Stakman, L. Hines, H. G. Ukkelberg, and W. Butler (p. 34); Some Experiments with a Yellow Mosaic of Tomato, by W. G. Stover and M. T. Vermillion (p. 34); Evidence Regarding the Shape of Tobacco-Mosaic-Virus Particles, by W. N. Takahashi and T. E. Rawlins (pp. 34, 35); *Stilbum cinnabarinum*, the Cause of a New Fig Disease in Louisiana, by E. C. Tims (p. 35); *Leptosphaeria salvinii*, the Ascigerous Stage of *Sclerotium oryzae*, by E. C. Tullis (p. 35); Further Purification of the Virus of Tobacco Mosaic, by C. G. Vinson (p. 35); Comparative Studies of Peas Resistant and Susceptible to *Fusarium* Wilt and Relation of Soil Fertility to Incidence of *Aphanomyces* Root Rot of Pea, both by J. C. Walker (p. 36); *Nectria* Canker of Basswood, by D. S. Welch (p. 36); Relation of Cranberry Varieties to the Spread of False Blossom, by R. B. Wilcox (p. 36); Bacterial Canker of *Prunus* spp. in California (pp. 36, 37) and Development and Control of Olive Knot (p. 37), both by E. E. Wilson; Influence of Spray Materials on Transpiration, by J. D. Wilson and H. A. Runnels (p. 37); Use of Formaldehyde Dust with Vegetable Seedlings, by J. D. Wilson and P. E. Tilford (p. 38); Nature of Rust Resistance in Beans, by S. A. Wingard (p. 38); Intracellular Bodies in Ring Spot, by M. W. Woods (p. 38); *Sclerotinia* Stem Canker of Hollyhock and Soil Infestation by Chlamydospores of *Tilletia levis* in Montana, both by P. A. Young (p. 39); and Transmissibility of Certain Legume-Mosaic Viruses to Bean (p. 39) and Transmission of Bean-Mosaic Virus by Insects (p. 40), both by W. J. Zaumeyer.

Report of the eighteenth annual meeting of the Pacific division of the American Phytopathological Society (*Phytopathology*, 24 (1934), No. 10, pp. 1134-1149).—Abstracts of the following papers are given: Breeding for Resistance in Blackeye Cowpeas to *Fusarium* Wilt, Charcoal Rot, and Nematode Root Knot, by W. W. Mackie (p. 1135); A Method of Inducing Knots on Cuttings of the Oleaceae by *Bacterium savastanoi*, by C. O. Smith (p. 1135); Spotted Wilt of Head Lettuce, by C. M. Tompkins and M. W. Gardner (pp. 1135, 1136); Spotted Wilt of Tomatoes and Its Transmission by Thrips, by M. W. Gardner and O. C. Whipple (p. 1136); A Destructive Virus Disease of Cauliflower and Other Crucifers, by C. M. Tompkins (pp. 1136, 1137); Breaking in Stock (*Mathiola incana*), a Virosis, by C. M. Tompkins (p. 1137); Growing Powdery Mildew on Detached Bean Leaflets and Breeding for Resistance, by B. Dundas (p. 1137); Observations on the Basidial Stage of *Sclerotium rolfsii*, by J. T. Barrett (pp. 1137, 1138); A Chytridiaceous Parasite of *Phytophthora*, by J. T. Barrett (p. 1138); A Bud Blight of Gooseberry Apparently Caused by Nematodes, by R. E. Smith, H. N. Hansen, and C. E. Scott (p. 1138); Quantitative Determinations of *Sclerotium rolfsii* in the Soils of Sugar-beet Fields, by L. D. Leach (pp. 1138, 1139); Seed Transmission of *Fusarium* Yellows of Beans, by J. B. Kendrick (p. 1139); Evidence Suggestive of the Existence of a Filterable Stage of *Bacterium tumefaciens*, by G. E. M. Clark (p. 1139); Nonsterile Soil Leachate Stimulating to Zoosporangia Production by *Phytophthora* sp., by F. P. Mehrlich (pp. 1139, 1140); Laboratory Experiments on the Control of Brown Rot of Lemons, by L. J. Klotz, H. S. Fawcett, and L. L. Huillier (p. 1140); Some Factors Influencing the Character of Interaction Between *Trichoderma* and Other Soil Fungi, by R. Weindling (pp. 1140, 1141); Various Fungi Recently Found to be Parasitic

on *Rhizoctonia solani*, by R. Weindling (p. 1141); The Use of Nitrogen Trichloride and Other Gases as Fungicides, by L. J. Klotz (p. 1141); A Survey Concerning a Native Pathogen, *Armillaria mellea*, by J. L. Hewitt (p. 1142); Experiments in Biological Control of *Rhizoctonia* Damping Off, by R. Weindling and H. S. Fawcett (p. 1142); Tobacco Mosaic on Spinach, by L. K. Jones (p. 1142); Heterothallism in Corn Rust, by R. F. Allen (pp. 1142, 1143); Heterothallism in Flax Rust, by R. F. Allen (p. 1143); The Parasitic Action of *Omphalia* sp. on Tissues of the Date Palm, by D. E. Bliss (p. 1143); A Case of Almond Blossom Infection by *Coryneum beijerinckii* Furnishing Inoculum the Following Year, by E. E. Wilson (pp. 1143, 1144); Localization of Symptoms During the Early Stages of Curly-top Infection in the Sugar Beet, by K. Esau (p. 1144); The Rate of Spread of the Veinbanding Virus on Potatoes, by L. K. Jones (p. 1144); Types of *Trichoderma* Rot of Lemons and Oranges, by H. S. Fawcett and R. Weindling (p. 1144); Interspecific Anastomosis and the Origin of New Types in Imperfect Fungi, by H. N. Hansen and R. E. Smith (pp. 1144, 1145); *Dematophora* Root Rot, by Harold E. Thomas, H. N. Hansen, and H. Earl Thomas (p. 1145); The Relation of Carbon-nitrogen Ratio and High Acidity to Color Production by *Fusarium* Species, by A. W. Dimock (p. 1145); Canker on *Chamaecyparis lawsoniana*, by J. W. Hotson and D. E. Stuntz (pp. 1145, 1146); The Use of Oil-soluble Copper as a Fungicide, by E. R. de Ong (p. 1146); Downy Mildew of the Hop in California, by C. E. Scott and H. E. Thomas (p. 1146); Control of Soil Fungi by Fumigation with Chloropicrin, by G. H. Godfrey (pp. 1146, 1147); New Economic Hosts of the Stem and Bulb Nematode, by G. H. Godfrey and C. E. Scott (p. 1147); The Use of Carborundum as an Abrasive in Plant-Virus Inoculations, by T. E. Rawlins and C. M. Tompkins (p. 1147); Soil Treatments for the Control of Cotton Root Rot Caused by *Phymatotrichum omnivorum*, by R. B. Streets (pp. 1147, 1148); Some Factors Influencing the Sporulation of Certain Species of *Phytophthora*, by L. J. Klotz and H. S. Fawcett (p. 1148); Physiologic Specialization in *Phytophthora* Species, by F. P. Mehrlich (pp. 1148, 1149); and Some Host Responses in Graft Transmissions of Dieback Streak of Tomatoes, by M. Shapovalov (p. 1149).

[Plant disease studies by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1934, pp. 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23*).—Brief summaries are given of the results of work on the breeding of sweet corn and popcorn for resistance to bacterial wilt; damage to corn kernels by *Diplodia*, *Fusarium moniliforme*, and *Basisporium gallarum*; wheat resistance to bunt, stem rust, leaf rust, and flag smut; control of the Columbia Basin foot rot of wheat (*Cercospora herpotrichoides*); barley resistance to scab; a soil-borne disease of milo; hybridizing rusts of wheat, rye, and grasses; selection of cotton for wilt resistance; control of cotton root rot and crazy top; control of hop downy mildew by field practices and by the development of resistant varieties; selection of alfalfa for resistance to bacterial wilt; the Dutch elm disease; white pine blister rust; brown spot disease of pine seedlings; *Phytophthora* root and collar disease of red pine; effect of mycorrhizas on the health of trees; prevention of stain, mold, and decay in logs and lumber; phony disease of peach; control of pecan diseases; fruit spot (*Cercospora*) of avocado; copper phosphate combined with bentonite-lime as a fungicide; southern celery mosaic; disease-resistant lettuce and melons; puffiness of tomatoes; control of bacterial canker of tomatoes; mosaic-tolerant bean; susceptibility of beans to mosaic diseases of white clover, alfalfa, and peas; halo blight and powdery mildew of beans; nematodes of sugar beet and shadscale; nematode associated with "sore shin" of cotton; curly top

"resistenes"; curly top reduction by range improvement; curly top and leaf spot resistance in sugar beet; biology of the sugarcane mosaic virus; a serious new type of sugarcane mosaic; the control of tobacco mildew (blue mold); the factors influencing tobacco wildfire and blackfire leaf spots; and tolerance of crops to boron and factors influencing boron injury from irrigation water.

Plant disease eradication [by the U. S. Department of Agriculture] (*U. S. Dept. Agr., Bur. Ent. Rpt., 1934, pp. 12-16*).—A summary is given of the work done in connection with barberry eradication (prevention of black stem rust), Dutch elm disease eradication, phony peach eradication, white pine blister rust control, and citrus canker eradication.

[Plant disease quarantines] (*U. S. Dept. Agr., Bur. Plant Quar. Rpt., 1934, pp. 34-38, 40-67*).—A summary is given of the work done to prevent the spread of narcissus eelworm (*Anguillulina dipsaci*), black stem rust (*Puccinia graminis*), phony peach disease (virus), Woodgate rust (*Peridermium* sp.), and white pine blister rust (*Cronartium ribicola*) in the United States, as well as foreign plant quarantines.

The Crop Protection Institute: Summary of progress, W. C. O'KANE (*Phytopathology, 24 (1934), No. 9, pp. 1048-1053*).—This article is a condensed summary of the progress and work of the Crop Protection Institute from the time of its organization, 12 yr. previously, up to January 1, 1934. The manner in which the board of governors, consisting of nine men, is constituted and the method followed in all of the research projects are stated. The article concludes with a brief summary of the 47 research projects already undertaken.

[Plant disease studies in California] (*California Sta. [Bien.] Rpt. 1933-34, pp. 39, 40, 41-43, 45, 59, 60, 61, 62, 63, 64, 70-72*).—Brief reports are given of the results of studies on the following subjects: The spotted wilt (virus) disease of tomatoes, lettuce, peppers, and other plants, including ornamentals; pea diseases; southern root rot (*Sclerotium rolfsii*) of sugar beets and its control; the curly top of sugar beets; development of smut-resistant and rust-resistant wheat varieties; seed treatment for barley stripe disease; control of mottle-leaf in citrus trees by zinc sulfate-lime sprays; psorosis or scaly bark, of citrus, a virus transmitted by budding; the biological control of citrus damping-off by the use of certain soil fungi in acid soils; control of brown rot of citrus fruits by from 1 to 2 percent soda ash, trisodium phosphate, or sodium silicate; spraying with zinc sulfate-lime for citrus brown rot prevention without danger of injury from cyanide fumigation of the trees; tests of citrus stocks for disease resistance; experiments on "vaccination" of citrus trees against fungus attack; use of nitrogen trichlorite gas against citrus storage and transit decay; sun blotch (virus) of avocado; eradication of the date decline disease, due to a root rotting fungus, by means of soil disinfection and selection for resistance to this disease; control of water injury of Deglet Noor dates; control of bacterial blight of English walnuts with bordeaux mixture; use of zinc sulfate against walnut yellows; a new southern California peach disease of unknown origin called "the 1933 disease"; testing of stone fruit rootstocks for resistance to root knot nematode (*Heterodera marioni*); the relation of soil and tree treatments with compounds of iron, zinc, copper, etc., to deficiency diseases such as die-back, chlorosis, little leaf, and exanthema of orchard trees; relation of winter eradication to fire blight control (*Bacillus amylovorus*); the importance of weather conditions and the lack of importance of infected beehives in relation to fire blight spread; and control of olive knot with bordeaux mixture.

[Plant disease studies of the New York State Station] (*New York State Sta. Rpt. 1934, pp. 24-28, 29, 31, 32*).—Summaries are given of work on crown

gall and hairy root of apple trees; the evaluation of different applications of lime-sulfur for apple scab in 1933; apple scab control in the Hudson Valley; red copper oxide as a spray and dust fungicide; mosaic of string beans; effect of the weather on seed decay, damping-off, and root rot; mosaic control in black raspberries; mild mosaic in Columbian purple raspberries; testing for mosaic klenclidity in black raspberries; raspberry anthracnose control; potato seed treatment with yellow oxide of mercury; bacterial wilt of sweet corn; root knot nematode of potatoes; and tests of canning crop and vegetable seeds for seed-borne diseases.

Plant disease study employs new attack, J. G. HORSEFALL (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, p. 9, figs. 2).—The author discusses the importance of treatment to protect germinating seeds from soil-borne organisms, not merely from seed-borne pathogens.

[Plant disease studies in West Virginia] (*West Virginia Sta. Bul.* 263 (1934), pp. 20, 24–26, figs. 2).—Briefly summarized are the results of studies on black pox (*Helminthosporium papulosum*) and similar diseases of apples, black walnut canker (*Nectria galligena*), watermelon wilt fungus (*Fusarium nivaeum*), resistance of red cedars to rust (*Gymnosporangium*), and comparative studies of bordeaux mixture made in different ways.

[Plant disease studies in Wyoming] (*Wyoming Sta. Rpt.* 1934, pp. 6, 7).—Brief reports are included of experiments with seed potato treatment for *Rhizoctonia* and scab, with notes on bacterial wilt of alfalfa and chlorosis (yellows) of cottonwoods.

The antiquity of *Puccinia graminis* and *Ustilago tritici* in California, G. W. HENDRY and H. N. HANSEN (*Phytopathology*, 24 (1934), No. 11, pp. 1313, 1314).—This contribution from the University of California reports that sun-dried adobe bricks taken from a ruined chapel erected in California in 1793 and 1794 and restored in 1832 yielded well-preserved fragments of Little Club wheat (*Triticum compactum humboldtii*) bearing teliospores and urediospores of *P. graminis* and spores of *U. tritici*, thus establishing the presence of both in the State prior to 1832, a new early record.

Phytopathological and taxonomic aspects of *Ophiobolus*, *Pyrenophora*, *Helminthosporium*, and a new genus, *Cochliobolus*, C. DRECHSLER (*Phytopathology*, 24 (1934), No. 9, pp. 953–983, figs. 3).—The author reviews the history of the taxonomic and nomenclatorial disposition of the collection of forms indicated in the title. He then discusses the morphological and developmental considerations on the basis of which these forms should be grouped. On account of the localization of perithecia on culm bases, presence of superficial network of hyphae, and similarities in dimensions of asci and in dimensions, septation, and arrangement of ascospores, the author regards *O. herpotrichus*, *O. graminis*, and *O. oryzinus* as closely related to one another but without near affinity to the other forms under *Ophiobolus*. *O. herpotrichus*, which, due to its confusion with *O. graminis*, has long retained an undeserved reputation for destructiveness in Europe, is reported for the first time as occurring widely in the United States on dead stems of quackgrass (*Agropyron repens*) in the spring.

A number of species of *Ophiobolus* have been connected with asexual stages of the *Phoma* type. The validity of this association received corroborative evidence when the author obtained no *Helminthosporium* stage in cultures of over a dozen species of *Ophiobolus* isolated from herbaceous plants but did obtain pycnidia with two of them from dead stems of *Ambrosia trifida*. These two, *O. fulgidus* and an undescribed species often confused with it, are compared and illustrated by drawings.

The forms hitherto grouped with *Ophiobolus*, but characterized by spirally arranged ascospores and by an asexual stage of the *Helminthosporium* type with bipolar germination, are separated off under the name *Cochliobolus* n. g., which is described with Latin diagnosis and for which the fungus causing leaf spot of maize (*C. heterostrophus* n. comb.) (E. S. R., 59, p. 842) is designated as type species. Here belong a considerable series of forms parasitic on graminaceous and possibly cyperaceous hosts.

The fungi having as asexual stages *Helminthosporium* type spores with indiscriminate (not bipolar) germination (including *Cylindro-Helminthosporium* and *Drechslera*) are held not to belong to *Ophiobolus* nor to *Cochliobolus*, but if possessed of hard sclerotoid perithecia are referred to the recently rehabilitated natural genus *Pyrenophora*. Here belong a number of important parasites of *Gramineae*. The genus *Pleospora* is distinguished from *Pyrenophora* on the basis of absence (in the former) of sclerotia or sclerotoid perithecia and *Helminthosporium* type conidia and inclusion of *Macrosporium* type conidia.

Medium for growth of pythiaceous fungi, F. P. MEHRICH (*Phytopathology*, 24 (1934), No. 10, pp. 1127, 1128).—From the standpoint of ease of preparation, precise duplication, availability, clearness when used as a liquid medium or with agar, and excellence of vegetative growth and reproduction with such forms as *Phytophthora*, *Nematosporangium*, and *Pythium*, a medium of the following composition has given more satisfactory results than other media tried: 1 g KH_2PO_4 , 0.5 g MgSO_4 , 1 g Bactopeptone (Difco standardized), 5 g Difco extract of malt (desiccated powder), 15 g dextrose, 1 l water, autoclaved 30 min. at 15 lb. Fifteen g agar-agar (Difco standardized) may be added per liter.

Immunity and anticancer vaccinothrapy in plants [trans. title], I. GHEORGHITU (*Compt. Rend. Soc. Biol. [Paris]*, 109 (1932), No. 15, pp. 1387-1389).—Agar cultures of *Bacterium tumefaciens* heated to 60° C. and injected into *Peltargonium* apparently prevented infection when the plants were inoculated from 30 to 40 days afterward with virulent bacteria. When the vaccine was administered repeatedly at from 5- to 6-day intervals to plants with from 4- to 6-month-old crown galls, the latter gradually dried up as the treatment continued.

Conidial production in species of *Cercospora* in pure culture, C. M. NAGEL (*Phytopathology*, 24 (1934), No. 10, pp. 1101-1110, fig. 1).—In studies at the Iowa Experiment Station, new isolations and spore transfers from sporulating cultures of *C. althacina*, *C. avicularis*, *C. beticola*, *C. cruenta*, *C. davisii*, *C. dubia*, *C. mühlenbergiae*, *C. moricola*, *C. mirabilis*, *C. medicaginis*, *C. physalidis*, and *C. setariae* yielded abundant conidia under favorable conditions in 36-72 hr., while transfers of mycelium, in general, gave only sterile growth. By transferring at definite intervals ranging from 4 to 6 days, conidium-producing cultures were, in some cases, maintained as long as 3 mo. A medium favorable for sporulation of one species of *Cercospora* did not always prove equally favorable for other species. In preliminary experiments, using mycelium transfers from stock cultures of *C. beticola*, *C. dubia*, *C. davisii*, and *C. zebrina* to 30 different kinds of media, no conidial production was observed.

The production of perithecia in *Ceratostomella ips* Rumb, J. G. LEACH (*Phytopathology*, 24 (1934), No. 9, pp. 1037-1040, fig. 1).—In studies at the Minnesota Experiment Station, some single ascospore cultures of *C. ips* formed both perithecia and conidia while others formed only conidia. When the latter cultures were mated in all possible combinations, no perithecia were produced. When single conidia were isolated from cultures which produced perithecia, some produced perithecia while others produced only conidia.

Also when these single conidium cultures, producing only conidia, were mated in all combinations, no perithecia were formed. These results would indicate that the loss of the ability to form perithecia in this fungus is due to something other than segregation for sex.—(*Courtesy Biol. Abs.*)

Chlorosis of peaches and roses [trans. title], G. B[ELLAIR] (*Rev. Hort. et Agr. Afrique Nord*, 38 (1934), No. 10, pp. 261-264).—Chlorosis due to nutritional and environmental factors is discussed. Sprinkling in the spring with a solution of 4 g nitrate of soda, 5 g sulfate of potash, and 1 g sulfate of magnesium in 10 l of water is suggested.

A new species of Pestalotia on Podocarpus, R. W. G. DENNIS (*Phytopathology*, 24 (1934), No. 9, pp. 1026-1028, fig. 1).—A leaf spot of *Podocarpus elongata* is described and attributed to infection by *Pestalotia podocarpi* n. sp. A full description and a Latin diagnosis of the fungus are provided.—(*Courtesy Biol. Abs.*)

Identification of Phytophthora species, L. H. LEONIAN (*West Virginia Sta. Bul.* 262 (1934), pp. 36, figs. 7).—After discussing the problem of classifying the genus *Phytophthora*, the author presents the results of his culture studies with approximately 100 isolates obtained from about 40 different species of plants and from soil, which, along with *P. infestans*, *P. thalictri*, and *P. phaseoli*, include all the species of this genus that according to him have even a slight claim to taxonomic distinction. Solid and liquid media of described composition were used under uniform conditions. The effect of different concentrations of malachite green from 1:2,000,000 to 1:12,000,000 on the growth of all strains is presented in a table, as is the effect of temperature (8°, 31°, 35°, and 37° C.). The ability of the different strains to produce sporangia and oogonia from well-nourished mycelium in distilled water is reported. Records are given of the differential growth in the presence of 0.1 and 0.2 percent tartaric acid and 0.25 percent anhydrous potassium carbonate.

In the light of the data obtained, the author thoroughly discusses the members of this genus and their relationships, and deals with the effects on taxonomic concept of the dissociations which have been met with in the group, as, for example, the 90 dissociants of *P. parasitica rhei* with which he has worked. The remarkable behavior of one of these in successive cultures for over 6 yr. is diagrammed to show how far from permanently fixed the characteristics may be.

The author is inclined to believe, as a result of his experiences, that there are but three "good" species in *Phytophthora*, namely, *P. infestans*, *P. cactorum*, and *P. palmivora*, but in view of the advantage of narrower identification of recognizable subdivisions within these three, he differentiates 22 distinct species and varieties and presents a taxonomic key, based on the data resulting from his experiments and on dependable information obtained by other workers, by which these may be distinguished from each other.

The original should be consulted for the detailed discussion of the species of *Phytophthora* appearing in previous literature and for the author's individual disposition of them.

A contribution to the method of the estimation of the infection of soil by Plasmodiophora brassicae Wor., T. I. FEDOTOVA (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect., Phytopath., No. 3 (1933), pp. 51-83, pl. 1, figs. 6; Eng. abs., pp. 81, 82)*).—Methods are described for rapid routine examination of soil samples as a basis for deciding what preventive measures are warranted. Direct spore counts are made from a soil suspension, or spores are washed out of the soil sample and counted. Spore vitality is determined by using a sugar

solution which plasmolyzes those still alive. Soil samples kept over 4 days indoors were found unsatisfactory.

A contribution to the knowledge of the influence of soil factors on the development of Plasmodiophora in Cruciferae, N. A. NAUMOVA (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect.), Phytopath., No. 3 (1933), pp. 32-50, pls. 3, figs. 2; Eng. abs., pp. 47, 48*).—Susceptibility to clubroot was found to depend on the degree of soil infestation; the physical and chemical make-up, moisture content, and reaction of the soil; and the anatomical structure of the host plant as influenced by environmental factors. Soil neutrality and 80 percent moisture content were nearly optimum for attack. The infection range lay between pH 5.7 and 8.4 and between 45 and 100 percent soil moisture content.

The Polyporaceae of New York State (pileate species), J. L. LOWE (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 41 (1934), pp. 142, figs. 2*).—This contains detailed descriptions, with measurements and notes, of 146 species of pileate polypores. Keys, a glossary, and a combined host and fungus index aid in the identification of the fruiting bodies of these wood destroyers.

White pycnia and aecia of Puccinia graminis, R. U. COTTER (*Phytopathology, 24 (1934), No. 10, pp. 1121, 1122*).—In cooperative studies between the U. S. Department of Agriculture and the Minnesota Experiment Station, when leaves of barberry (*Berberis vulgaris*) were inoculated with teliospores from a certain collection of rusted *Agrostis alba*, approximately one-fourth of the resulting pycnia were white, the remaining three-fourths being of the normal yellow type. Aecia produced as a result of white×white pycnial "crosses" were white, but those resulting from white×yellow crosses were yellow. Except for the absence of color, white aecia were normal in appearance. The white aeciospores germinated normally, but the results of inoculations were inconclusive.—(*Courtesy Biol. Abs.*)

The relation of Uromyces caladii and other rusts to their hosts, M. A. RICE (*Bul. Torrey Bot. Club, 61 (1934), No. 3, pp. 155-162, pls. 3*).—The author questions, in the light of her studies, the interpretation given by Dufrenoy (*E. S. R., 67, p. 689*) in reference to the relation of host cells and haustoria. She believes that *U. caladii* neither penetrates nor plasmolyzes the host cytoplasm.

"Galvanizing" soil to stop damping-off, J. G. HORSEFALL (*Farm Res. [New York State Sta.], 1 (1935), No. 2, pp. 1, 2, fig. 1*).—This is a popular presentation of the results of work to find some relatively noninjurious chemical that could be applied to the surface of the soil as a supplement to seed treatment. Zinc oxide spread over the surface of the soil after planting, at the rate of 0.75 oz. per square foot, controlled damping-off well, provided the seed was previously treated with red copper oxide or zinc oxide to prevent preemergence attack.

The evaluation of chemical analyses for the estimation of smoke injury [trans. title], F. BERAN (*Neuheit. Geb. Pflanzenschutz., 27 (1934), No. 6, pp. 139, 140*).—Analyses of plants of the same species from the same location at different times of day showed such variations that it is held necessary always to take samples at the same time of day if the analytical results are to be comparable.

The inability of Aplanobacter insidiosum to enter alfalfa seedlings in the absence of wounds, G. L. PELTIER (*Phytopathology, 24 (1934), No. 9, pp. 1044, 1045*).—The possible spread of alfalfa wilt by soil water was tested by growing Grimm seedlings in the greenhouse at the Nebraska Experiment Sta-

tion so that unwounded and uninoculated seedlings received all their water as run-off from infected seedlings. At the end of 5 mo. no new infection occurred. About 2,500 plants were used. It is concluded that the bacteria were unable to infect in the absence of fresh wounds.—(*Courtesy Biol. Abs.*)

Barley smut control and certified seed, M. L. RUTTLE [NEBEL] (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, p. 2, figs. 7).—Based on the results of studies already published (E. S. R., 71, p. 490), the suggestion is given that seed treatment should be more extensively used and that with certified seed care should be taken that the seed bags and seeder are not contaminated.

Present status of cabbage improvement with regard to kraut type and disease control, J. C. WALKER (*Canner*, 74 (1932), No. 11, II, p. 51).—This summarizes popularly the results of 10 yr. of cabbage breeding work for resistance to cabbage yellows conducted by the Wisconsin Experiment Station in cooperation with the U. S. Department of Agriculture.

Infection of *Zea mays* and various other Gramineae by the celery virus in Florida, F. L. WELLMAN (*Phytopathology*, 24 (1934), No. 9, pp. 1035–1037, fig. 1).—Plants of maize (*Z. mays*), teosinte (*Euchlaena mexicana*), sweet milo, and kafir sorghums (*Holcus sorghum*), wheat (*Triticum aestivum*), and rye (*Secale cereale*) were all successfully infected with celery virus 1 (E. S. R., 72, p. 496) by using from 15 to 20 viruliferous *Aphis gossypii* per plant. A stripe on maize occurring in the field in Florida was found due to this virus. It differed from the white stripe of corn in Cuba, as determined by a comparison of symptoms both in Florida and Cuba. *Peregrinus maidis* was found not to be a vector of the celery virus stripe, while it is known to be the important carrier of the Cuban white stripe. Celery virus 1 was found attacking several crops in Cuba, but was not found there on maize.—(*Courtesy Biol. Abs.*)

The mode of entrance of *Ustilago zeae* into corn, J. M. WALTER (*Phytopathology*, 24 (1934), No. 9, pp. 1012–1020, figs. 2).—Plants of 4 standard varieties of 12 selfed lines of corn (*Zea mays*) were inoculated with *U. zeae* in various ways, principally in the young leaf spirals by the hypodermic syringe method. After processing by the paraffin method these plants were studied microscopically for penetration by the germ tubes of the fungus. It was found that the germ tubes enter the plant by direct penetration through the epidermis of young cells and are attracted little, if any, by the stomata. Chlamydospores, as well as sporidia, give rise to germ tubes that penetrate the host directly and without evidence of promycelium production. Even though numerous and varied studies were made of inoculated silks stained fresh with thionine, no case of entrance through style and stigma was observed. Attention is called to the possible relation of a necrosis of heavily inoculated tissues to resistance of corn to *U. zeae*.—(*Courtesy Biol. Abs.*)

The inheritance of *Fusarium* wilt resistance in flax, C. R. BURNHAM (*Jour. Amer. Soc. Agron.*, 24 (1932), No. 9, pp. 734–748, figs. 2).—This contribution from the Wisconsin Experiment Station reports that tests showed certain flax strains to be completely susceptible to *F. lini*, others highly resistant, and still others intermediate. The organism was successfully isolated from stems of plants of a resistant strain which appeared completely healthy. The possible existence of different factors for resistance was indicated.

Horseradish black root disease and its control [trans. title], G. KORFF and K. BÖNING (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz*, 11 (1934), No. 12, pp. 273–277, figs. 2).—The disease caused by *Verticillium dahliae* is described. All environmental factors unfavorable to the growth of horseradish were found to favor the disease and vice versa. Selection of favorable soil types,

planting of cuttings free from vascular discoloration, use of clean soil for holding cuttings previous to planting, and crop rotation are suggested. The possibility of field selection for resistance is suggested.

Big vein, a disease of lettuce, I. C. JAGGER and N. CHANDLER (*Phytopathology*, 24 (1934), No. 11, pp. 1253-1256, fig. 1).—Big vein causes striking, enlarged, light yellow leaf veins, with more or less stunting of affected plants. Evidence is given that the disease is soil borne. It is becoming prevalent in California and Arizona on heavier soils where lettuce is grown with little or no rotation. The nature of the disease is undetermined, but a virus is suggested.—(*Courtesy Biol. Abs.*)

Disease resistance in *Allium fistulosum*, E. L. FELIX (*Phytopathology*, 23 (1933), No. 1, pp. 109, 110).—To this species belong several varieties of onions, including Winterhecke (White Welsh) and Nebuka strains. Resistance to *Urocystis cepulae*, *Phoma terrestris*, and *Peronospora schleideni* proved high in certain representatives of this species.

Pea diseases and their control, L. L. HARTER, W. J. ZAUMEYER, and B. L. WADE (*U. S. Dept. Agr., Farmers' Bul.* 1735 (1934), pp. [2]+25, figs. 13).—This presents, for the benefit of growers, the general situation relative to the pea industry in the United States and the losses sustained from diseases. It discusses the manner in which the various diseases are disseminated and outlines the relation of farm practices to disease control, with particular reference to seed disinfection and crop rotation.

The main portion of the publication is devoted to a popular description of the principal pea diseases, with a discussion of the life history, mode of dissemination, and the most effective practical control measures available. The diseases dealt with are *Ascochyta* blight (due to three species), bacterial blight (*Bacterium pisi*), *Fusarium* wilt (*F. orthocercus pisi*), near wilt (due to an undescribed organism), root rots (caused by various fungi), root knot (*Heterodera marioni*), *Septoria* blight (*S. pisi*), powdery mildew (*Erysiphe polygoni*), anthracnose (*Colletotrichum pisi*), downy mildew (*Peronospora viciae*), and mosaic (virus).

Studies on the common potato scab and its causal organisms [trans. title], F. WINGERBERG (*Kühn Arch.*, 33 (1932), pp. 258-295, figs. 3).—Thirty-seven different strains of *Actinomyces* were isolated from scabby potatoes or from sectors in cultures and compared with 4 strains obtained from the Central Bureau in Baarn, Netherlands. The relationships of these to various external factors and cultural conditions proved to be very diverse. While some preferred alkaline reaction, there were also those that were not sensitive to acid conditions. Differences in utilization of different sources of nitrogen and differences in diastatic action were found. The resistance to scab appeared to rest on a purely physiological basis and could not be determined without the aid of the pathogen. The relative resistance of a variety could be determined quickly by the character of infection on young stems in soil treated with spore suspensions.

Aphid transmission of potato yellow dwarf, K. KOCH (*Phytopathology*, 24 (1934), No. 10, pp. 1126, 1127).—That the natural vector of yellow dwarf is probably *Myzus persicae* is indicated by the high percentage of transmission obtained with this insect in greenhouse trials at the University of Wisconsin, as judged by the characteristic development of rusty discoloration in the stem pith. Mostly negative results were obtained from attempts at transmission by *Macrosiphum solanifolii* and with *Thrips tabaci*.

The copper test for distinguishing sound and degenerated potatoes [trans. title], H. BECHHOLD, W. GERLACH, and F. ERBE (*Angew. Chem.*, 47

(1934), No. 2, pp. 26-30, figs. 3).—The authors report the results of efforts to learn the mechanism of the copper test already referred to (E. S. R., 71, p. 22). In this method strips of copper about 0.6 mm thick, 10-13 mm wide, and 50-80 mm long were stuck into the tubers, which were placed for 7-8 hr. in a moist chamber at 37°-38° C., then kept at about 20° some 16 hr. The copper strips were then pulled out, the tubers cut lengthwise, and the degree of discoloration observed.

In healthy tubers a black discoloration extends into the flesh some distance out from the puncture, while in devitalized tubers little or no discoloration occurs. Chemical analysis showed that dissolved copper occurred only in the blackened tissue and was equally distributed therein. Furthermore, within the blackened tissue the copper concentrations were no higher in the high vitality tubers than in the degenerated ones.

The authors conclude that since, in tubers of high vigor, the blackening (melanin-formation) started from the point of injury as a chain reaction, the copper acts in the discolored zone as a catalyzer. With the degenerated tubers, the chain reaction does not take place. Spectroscopic analysis indicated that copper displaces the potassium normally present in the tubers.

The occurrence of stem rot of rice in California, E. C. TULLIS, J. W. JONES, and L. L. DAVIS (*Phytopathology*, 24 (1934), No. 9, p. 1047).—Stem rot of rice (*Leptosphaeria salvinii*) has been found for the first time in plots at the Biggs Rice Field Station, Biggs, Calif., and in commercial fields in that State. The disease was apparently introduced into the State on seed of Early Prolific rice from Arkansas in 1931.—(*Courtesy Biol. Abs.*)

Panicles of Rexoro rice injured at emergence by sun scald, E. C. TULLIS, A. L. SMITH, and A. G. JOHNSON (*Phytopathology*, 24 (1934), No. 9, pp. 1043, 1044).—Sunscald of panicles of Rexoro rice as observed in rice fields south of Lake Charles, La., is described. The injury appeared immediately after emergence of the panicles and was undoubtedly caused by high temperatures and somewhat increased wind velocities on clear, bright days. The same type of injury had been observed on this variety previously at the Rice Experiment Station at Crowley.—(*Courtesy Biol. Abs.*)

Distribution of downy mildew mycelium in spinach fruits, L. D. LEACH and H. A. BORTHWICK (*Phytopathology*, 24 (1934), No. 9, pp. 1021-1025, figs. 2).—This paper from the University of California, at Davis, reports that the mycelium of *Péronospora effusa* occurs in abundance in the outer portion of the calyx tube of infected spinach fruits. From the base of the calyx tube the mycelium enters the ovule through the funiculus, and from this point spreads throughout most of the integument, thus enveloping the ovule. The nucellus is invaded by mycelium that enters through the chalaza. No evidence of seed transmission was obtained from limited germination trials with infected seed.—(*Courtesy Biol. Abs.*)

Observations on the influence of rainfall on the development of the heart rot of the sugar beet [trans. title], G. FRON (*Compt. Rend. Acad. Agr. France*, 20 (1934), No. 27, pp. 883-888).—Heart rot of sugar beet with which *Phoma tabifica* has been thought associated is held to be intimately tied up with soil moisture deficiencies, which, in turn, may be due to low soil moisture reserves resulting from subnormal winter rainfall.

Some pathological observations on sugar cane × sorghum hybrids in Florida, B. A. BOURNE (*Phytopathology*, 24 (1934), No. 11, pp. 1314, 1315).—The susceptibility of 58 hybrids between sugarcane (P. O. J. 2725) and the *Holcus sorghum saccharatus* variety Texas Seeded Ribbon to certain diseases occurring on the parent grasses was studied at the Florida Experiment Station.

Approximately two-thirds were found susceptible to the cane diseases due to *Helminthosporium ocellum* and *H. stenospilum*, one-third to brown spot (*Cercospora longipes*), and one-fourth to the red rot of the sheath (*Colletotrichum falcatum*). So far none have become infected with cane mosaic or the sorghum rust (*Puccinia purpurea*) on Okeechobee muck soil.—(*Courtesy Biol. Abs.*)

Types of mosaic on sugar cane in Louisiana, E. M. SUMMERS (*Phytopathology*, 24 (1934), No. 9, pp. 1040-1042, fig. 1).—Four types of sugarcane mosaic have been differentiated on the basis of symptoms, which are described, produced by inoculations on seedling variety C. P. 28/60 and Louisiana Purple (Co. 281). Type 1 has been collected only from four C. P. seedlings, type 2 from all varieties tested except P. O. J. 213, type 3 from Co. 281 only, and type 4 from Co. 281 and all collections of P. O. J. 213. Whether these four types of mosaic are the expressions of individual strains of the same virus or whether they represent distinct virus diseases is yet to be determined.—(*Courtesy Biol. Abs.*)

Sugarcane mosaic in Antioquia [trans title], R. MEJIA (*Bol. Agr. [Medellin, Colombia]*, 8 (1934), No. 194, pp. 3-9, pl. 1).—The occurrence of sugarcane mosaic in Antioquia, Colombia, is reported. The symptoms are described and distinguished from those of other disorders. Existing information on control is summarized.

[Tobacco downy mildew or blue mold control] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1934, p. 92).—Brief reference is made to the results of experiments on the use of warm night temperatures for the prevention of the disease in seedbeds.

Downy mildew (blue mould) of tobacco.—I, The influence of overwintered plants; II, Wild hosts; and III, Spraying, A. V. HILL and H. R. ANGELL (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 4, pp. 260-268, pl. 1, fig. 1).—Diseased tobacco plants were found to carry downy mildew through the winter and to act as sources of seedbed infection. *Nicotiana glauca* and *N. suaveolens* are reported to be wide-spread wild hosts in Australia. Spraying seedlings with 2-2-40 bordeaux mixture did not give effective control near other disease sources. Dry air and soil conditions prevented the disease from becoming destructive. Isolated seedbeds did not develop early outbreaks of downy mildew.—(*Courtesy Biol. Abs.*)

Inheritance of ability to localize tobacco-mosaic virus, F. O. HOLMES (*Phytopathology*, 24 (1934), No. 9, pp. 984-1002, figs. 3).—"Localization of tobacco mosaic virus in *Capsicum frutescens*, the garden pepper, was found to be determined by a dominant Mendelian factor. In plants possessing this factor the virus increased in tissues at the site of inoculation and caused the appearance of numerous necrotic spots of small size, with early abscission of the inoculated leaf and subsequent healthy growth of the plant to maturity. The recessive allelomorph allowed systemic spread of virus, stunting of plant, mottling and distortion of leaves, and reduced yield of fruit.

"Somewhat similar genetic factors, determining necrotic response, were found in a number of *Nicotiana* species and in *Solanum melongena*."

Multiplication of the viruses of tobacco and aucuba mosaics in growing excised tomato root tips, P. R. WHITE (*Phytopathology*, 24 (1934), No. 9, pp. 1003-1011, fig. 1).—A method has been developed for the cultivation of the viruses of tobacco mosaic and aucuba mosaic in isolated root tips grown in vitro in a nutrient medium (*E. S. R.*, 71, p. 28). The viruses have multiplied actively under controlled, aseptic conditions, in the apparent absence of chlorophyll, and without the production of obvious symptoms. The method provides

a simple means of maintaining stocks of these two viruses in a state of active multiplication, yet free from danger of contamination with other viruses.

Chemical studies on the virus of tobacco mosaic.—I, Some effects of trypsin, W. M. STANLEY (*Phytopathology*, 24 (1934), No. 10, pp. 1055–1085, figs. 3).—The decrease in infectivity of the virus of tobacco mosaic on addition of trypsin, as measured on *Nicotiana glutinosa* and *Phaseolus vulgaris*, is held not to be due to the proteolytic activity of the trypsin because these studies showed (1) that the loss in infectivity was immediate, (2) that it could take place over a wide range of H-ion concentrations, including some at which trypsin is inactive proteolytically, and (3) that the infectivity of the virus could be regained by heat, by dilution, or by digestion and removal of trypsin. A similar loss of the infectivity was found to take place on addition of trypsinogen or globin, proteins which possess no proteolytic activity, but which, like trypsin, have isoelectric points above pH 7. Virus, sufficiently concentrated so that it produced lesions on *P. vulgaris* when diluted 10^{-8} , did not affect the rate of diffusion of trypsin through a Northrop-Anson cell at a concentration of about 1 mg of trypsin nitrogen per cubic centimeter. It was possible to prepare a trypsin virus solution that produced no lesions on plants of *P. vulgaris* but produced many lesions when tested on plants of *N. glutinosa* having about an equal susceptibility to untreated virus. The decrease of the infectivity of this virus on addition of trypsin was demonstrated upon a number of different species belonging to the genera *Nicotiana*, *Datura*, *Phaseolus*, *Physalis*, *Solanum*, and *Capsicum*. Infectivity was similarly decreased by trypsin in trials with a masked and a yellow strain of tobacco mosaic, aucuba mosaic, severe etch, tobacco ring spot, ordinary cucumber mosaic, and a yellow strain of cucumber mosaic virus.

Trypsin sprayed or rubbed on the leaves of plants of *N. glutinosa*, *N. tabacum* Turkish, and *Phaseolus vulgaris* markedly lowered their susceptibility to the virus, but the plants became susceptible again upon washing the trypsin from the leaves with water. Trypsin showed an inhibitory effect if it was administered by either rubbing or spraying within about 30 min. after the inoculation of the leaf with virus. As a whole, the results seemed to indicate that this loss of infectivity was due chiefly to the action of trypsin on the plant rather than on the virus.

Cytological changes in the callus of the graft union in connection with curly top in tomatoes, J. DUFFRÉNOY and M. SHAPOVALOV (*Phytopathology*, 24 (1934), No. 10, pp. 1116–1118, figs. 2).—Approach graft, made to unite a healthy tomato plant with one which is infected by the curly top virus, results in a callusing permitting a passage of the virus through a few meristematic cells bridging over degenerated cells. Incidentally, it was noted that cells more deeply situated in the callus accumulate calcium oxalate crystals in their vacuolar solution.—(*Courtesy Biol. Abs.*)

Application of stream double refraction in the identification of streak diseases of tomato, W. N. TAKAHASHI and T. E. RAWLINS (*Phytopathology*, 24 (1934), No. 10, pp. 1111–1115).—In studies at the California Experiment Station juice from streaked tomato plants infected with a combination of tobacco mosaic and potato latent viruses exhibited a stream double refraction indistinguishable from that shown by plants infected with tobacco mosaic alone. Juice from plants infected with die-back streak (spotted wilt) exhibited a stream double refraction indistinguishable from that shown by juice from normal plants. It is held that the stream double refraction technic (E. S. R., 69, p. 673) may therefore be used in the rapid identification of these streak diseases.

Notes on the control of transit and storage decays of tomatoes by the use of chemical washes. W. S. PORTE (*Phytopathology*, 24 (1934), No. 11, pp. 1304-1312).—The relative effectiveness of 21 different chemical washes in controlling tomato fruit rots caused by *Phoma destructiva*, *Rhizoctonia solani*, and *Phytophthora terrestris* was tested on commercial samples of mature green Florida winter tomatoes in storage. With nearly all the solutions tested, a 3-min. soak at 115°-122° F. before storing resulted in a great reduction in the number of fruits infected from surface-borne inoculum found at the end of 9-17 days' storage and produced no observable injury. Most of the infections that developed were natural infections that could not be detected when the fruits were put in storage, and part of them could not be inhibited by the most effective washes tested.

One percent borax in 1:300 commercial formaldehyde gave the best average results but was nearly equalled by a number of other washes, including, e. g., 1:300 formaldehyde and combinations of this with K alum, $\text{Ca}(\text{ClO})_2$, or both, 1 percent $\text{Ca}(\text{ClO})_2$ with 1 percent K alum or borax, and 1 percent K alum alone. One-tenth percent HgCl_2 used as a check did not surpass the best nonpoisonous treatments. Rinsing did not reduce effectiveness enough to warrant its elimination after the treatment. Ethylene gas as used to accelerate the coloring of tomatoes had no effect on the development of rots.

Tests on wheat bunt in 1932 [trans. title], G. VIENNOT-BOURGIN (*Rev. Path. Vég. et Ent. Agr.*, 19 (1932), No. 8-10, pp. 257-284, pl. 1, figs. 4).—The effects on the various plant organs, on respiration, transpiration, and rust susceptibility were studied, using the variety Bon Fermier.

Treatment of wheat bunt [trans. title], G. ARNAUD and M. GAUDINEAU (*Compt. Rend. Acad. Agr. France*, 19 (1933), No. 13, pp. 465-469).—The relative resistance of a number of summer and winter varieties is given. Pathogenically specialized strains of the parasite were found.

Experiments on the effectiveness of "Davlitini" and other seed treatments in controlling wheat smut (Tilletia), B. KOKOLIOS (*Inst. Kallit. Fyton Thessalonike Epist. Delt.* 17 (1934), pp. [16]).—Without reducing germination Davlitini, a copper carbonate dust, controlled bunt as effectively as copper sulfate solutions.

Notes on experiments with wheat foot rot [trans. title], E. FOEX and E. ROSELLA (*Compt. Rend. Acad. Agr. France*, 19 (1933), No. 13, pp. 470-474).—The relation of time of seeding, of spacing, and of sulfuric acid treatment to attack by *Cercospora herpotrichoides* is presented.

Foot and root rots of wheat in Australia: The influence of the combined action of *Fusarium culmorum* (W. G. Sm.) Sacc. and *Urocystis tritici* Koern. on the occurrence of seedling blight, W. L. GEACH (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 4, pp. 269-278, pl. 1).—Considerable seedling blight occurred among wheat plants grown in a greenhouse in unsterilized soil from grain inoculated with *U. tritici*. The affected plants yielded *Fusarium* spp., generally *F. culmorum*, or *Helminthosporium sativum*, or both. More seedling blight occurred when a mixture of spores of *U. tritici* and *F. culmorum* was used for seed inoculation than when either of these organisms was used alone. Under field conditions, varieties highly resistant to *U. tritici* were only comparatively resistant to seedling blight caused by the combined attack of *F. culmorum* and *U. tritici*. Thus these two organisms acting together under ordinary field conditions are partly responsible for poor stands.—(Courtesy Biol. Abs.)

The effect of mildew infection on the response of wheat-leaf tissues normally resistant to leaf rust. C. O. JOHNSTON (*Phytopathology*, 24 (1934), No. 9, pp. 1045, 1046, fig. 1).—Large normal uredia of *Puccinia triticina* were observed to develop on the leaves of normally resistant wheat plants in localized areas previously infected with mildew (*Erysiphe graminis*). Leaf tissues outside of mildewed areas maintained their normal high type of resistance to leaf rust.—(*Courtesy Biol. Abs.*)

The wedge graft as a means of controlling overgrowths at the union of nursery apple trees. R. F. SUIT (*Phytopathology*, 24 (1934), No. 10, pp. 1086-1100, fig. 1).—The results of experiments conducted over a period of 3 yr. in 7 nurseries in 5 different States showed that the wedge graft was preferable to the whip and double-tongue grafts in the control of overgrowths at the union. The varieties Wealthy, Yellow Transparent, Whitney, and Duchess showed greater benefit from the wedge graft than Jonathan, Grimes Golden, and Delicious.

The use of nurserymen's tape as a wrapper for the grafts gave better results than the use of waxed string. The strength of the union of the wedge graft compared favorably with that of the whip and double-tongue grafts, while the stand of trees obtained with the wedge graft showed no marked difference from that obtained with the whip graft and was higher than that obtained with the double-tongue grafts.

Investigation of factors affecting advance of certain "apple-spot" fungi within the host tissue. F. M. CARTER (*Ann. Bot. [London]*, 48 (1934), No. 190, pp. 363-394, figs. 19).—Isolates of *Pleospora*, *Alternaria*, *Polyopeus*, and *Fusarium* from apples were grown on a medium with varying amounts of glucose, fructose, and sucrose plus varying amounts of malic acid and asparagine. In general, the sugar concentrations used did not alter the growth rates, but increasing concentrations of malic acid depressed them. The effect of asparagine varied with the species and with the amount of acid. The decreasing acidity of apples in storage appeared to be the most important factor favoring the spread of the fungi in the tissues.

Observations on the occurrence and development of the apricot *Monilia* in 1931 and 1932 in Vaucluse: Method of control [trans. title], M. ANRES and P. H. JOESSEL (*Rev. Path. Vég. et Ent. Agr.*, 19 (1932), No. 8-10, pp. 248-252).—The severity of the disease caused by *Sclerotinia cinerea* is discussed, and success in control is reported from the employment of pruning to produce an open top with scattered rather than clustered fruit, from the removal at pruning time of all mummies and infected twigs, and from the use of bordeaux mixture applied first when the winter buds are opening, again when the flower buds are about to open, and last when the shucks fall.

The results of treatment tests for the control of *Coryneum* of the apricot [trans. title], P. H. JOESSEL and M. ANRES (*Rev. Path. Vég. et Ent. Agr.*, 19 (1932), No. 8-10, pp. 253-255, pl. 1).—Two seasons' work in Vaucluse proved the effectiveness of spraying at the time of shuck fall with bordeaux or burgundy mixture containing 2 percent copper sulfate, or with neutral copper acetate 0.5 percent.

Water-table effects.—I, The gumming and death of plum trees. A. FIKRY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 141 (1934), pp. [3]+35, pls. 21).—This trouble of stone fruit trees in Egypt was studied by survey methods and by observations made in an experimental planting of 14 plum varieties worked on 4 different stocks. The disease is held to be associated with rise of the water table in relation to the depth of rooting and to the physical properties

of the subsoil. Injury was least in the case of trees on Mariana rootstocks and with the scion varieties America, Japanese Gold, Climax, and Mariana. Wickson proved the most subject to the disease. Low water table and deep drainage are advised.

A disease of the English Morello cherry caused by *Bacterium pruni*, J. C. DUNEGAN (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 8, pp. 745-754, figs. 4).—The symptoms produced by *B. pruni* on the leaves, fruit, fruit stems, and twigs of the English Morello cherry are described. It was found that the pathogen presumably overwinters in the tissues of the twigs. The appearance of the primary infections was found to depend upon environmental factors and to vary from season to season. Secondary infections on the leaves, fruit stems, and twigs may occur throughout the growing season. They were found to be somewhat common on small green cherries, but were observed only occasionally after the fruit had begun to turn color.

The pathological histology of the disease on the fruit is discussed. The bacteria eventually caused a complete destruction of all the cells in the invaded region from the epidermis to the stone, whereas the injury caused by the same organism in peach and plum rarely invades the fleshy tissue of the fruit, since in these fruits a periderm is initiated, and the diseased portion is separated from the other tissues by wound cork. In the English Morello cherry no evidence of wound cork has been observed, but the parenchyma cells lying between the invaded and the healthy tissues were found to become meristematic, producing a compact mass of cells smaller than normal which appeared to prevent further invasion.

The disease has been identified only on specimens from Missouri, Arkansas, and Iowa, but is thought to be wide-spread. The similarity between the symptoms produced on the leaves by *B. pruni* and *Coccomyces hiemalis* and the unusual symptoms on the mature fruit are thought to have delayed its recognition as a distinct disease.

Influence of rootstocks on the susceptibility of sweet cherry to the buckskin disease, T. E. RAWLINS and K. G. PARKER (*Phytopathology*, 24 (1934), No. 9, pp. 1029-1031).—This contribution from the University of California reports that sweet cherry trees on Mazzard and Morello stocks are very susceptible to natural infection with the buckskin disease, while those on Mahaleb stocks appear to be resistant. Trees on all of these stocks may readily be infected by grafting with diseased Napoleon scions, but the symptoms differ, depending on the rootstocks used. Trees on Mazzard and Morello stocks carry conical fruits that shrivel just before ripening, with pedicels that are shorter than normal, and leaves that may be smaller than normal but do not exhibit any visible chlorosis. Diseased trees on Mahaleb stocks, however, usually carry fruits normal in form that do not shrivel before ripening, while the leaves usually become very chlorotic. When an infected Napoleon scion was placed on one limb of a Mahaleb seedling and a healthy Napoleon scion on another limb, the infection did not pass through the Mahaleb seedling to the healthy scion.—(*Courtesy Biol. Abs.*)

A parasite of the grape mildew (*Trichothecium plasmoparae*) [trans. title], P. VIALA and P. MARSAIS (*Ann. Inst. Natl. Agron.*, 25 (1932), pp. 37-65, figs. 12).—Rose-colored to brick-red spots were observed in different years, under conditions of high humidity and high temperature, on grape leaves heavily infected with *Plasmopara viticola* in Montpellier, France (A similar phenomenon had been observed by Viala in New Jersey in 1887). Examination revealed the presence of a fungus parasitic on the downy mildew in these spots. This fungus is described and given the name *T. plasmoparae* n. sp. It grew readily in arti-

ficial media. The optimum temperature was high. Sporulation occurred above 30° C. The spores retained viability for 2 yr. under varying laboratory temperatures. Tests are projected to learn whether or not artificial inoculation of the grape mildew with this fungus would help in practical control.

A disease of banana, markedly similar to bunchy top, produced by celery virus 1 in U. S. A., F. L. WELLMAN (*Phytopathology*, 24 (1934), No. 9, pp. 1032-1034, fig. 1).—Plants of two species of banana, Lady Finger (*Musa sapientum*) and Cavendish (*M. Cavendishii*), were found to be susceptible to virus attack by celery virus 1 (E. S. R., 72, p. 496) when colonized with from 75 to 150 aphids (*Aphis gossypii*) which had been made viruliferous by feeding on either diseased celery or *Commelina nudiflora*. Two plants of *M. sapientum* were also infected by similarly using *A. maidis*. Diseased banana plants produced leaves which were likely to be tightly rolled and brittle, having chlorotically spotted petioles with malformed vascular bundles. Necrotic streaks and spots occurred on leaf blades. Leaf sheaths were short and often split, and there resulted a stunted rosettelike appearance of the whole plant similar to symptoms of bunchy top.—(*Courtesy Biol. Abs.*)

Experiments with the aster-yellows virus from several States, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 8 (1934), No. 10, pp. 305-325, figs. 4).—Using the leaf hoppers *Cicadula divisa* and *Thamnotettix montanus*, the author attempted, in a series of transmission experiments, to learn whether a single virus is responsible for the trouble called aster yellows in different parts of the United States. The evidence indicates that the eastern aster yellows (received from New York, Indiana, and Wisconsin) and the California aster yellows are not identical although having overlapping host ranges. Celery yellows of Utah is held probably to be identical with California aster yellows. Although *C. divisa* could transmit both eastern and California strains, *T. montanus* successfully transmitted the California strains but not the strains from New York and Wisconsin. Celery was resistant to the New York, Indiana, and Wisconsin strains, but not to the virus of aster yellows from California. The original article should be consulted for details regarding the virus strains used, the hosts tested, and the results of attempts to recover the virus from various host species.

Transmission of California aster yellows to potato by *Cicadula divisa*, H. H. P. SEVERIN and F. A. HAASIS (*Hilgardia* [California Sta.], 8 (1934), No. 10, pp. 327-335, figs. 4).—Previous attempts to transmit New York aster yellows to potato by using *C. divisa* having been unsuccessful, the authors attempted to transmit the California strain in the same way. "Fifty percent of the potato plants inoculated with California aster yellows developed symptoms of the disease. The most pronounced symptoms of the disease were purple, slender sprouts and aerial tubers arising from the axil of the leaves. The incubation period of the disease varied from 20 to 63 days during the four seasons. The virus was not recovered from infected potato plants nor from potato tubers obtained from plants showing symptoms of yellows. The disease has not been found in potato fields under natural conditions up to the present time, but *C. divisa* was taken in potato fields."

Transmission of California aster and celery-yellows virus by three species of leafhoppers, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 8 (1934), No. 10, pp. 337-361, pl. 1, figs. 2).—*Thamnotettix geminatus* successfully transmitted the virus from celery to celery and from carrot to white but not orange carrots, but failed to transmit virus from asters to any other plant tested or from celery or carrot to asters. *T. montanus* transmitted the virus from celery or aster with difficulty to aster but with fair success to celery.

It failed to transmit curly top to sugar beets. It was found to be a vector of celery yellows under natural conditions. *Cicadula divisa* transmitted the virus from asters and celery to asters and celery with greater efficiency than the other two. These insects were able to pick up and transmit virus from plants originally infected by either of the other two species. No distinction between the aster yellows and the celery yellows occurring in California was possible on the basis of vector relationships.

Felicia amelloides Voss, an unreported host for Erysiphe cichoracearum, F. L. HOWARD (*Phytopathology*, 24 (1934), No. 11, p. 1315).—From the Rhode Island State College, *E. cichoracearum* is reported as attacking the blue Agathea daisy (*F. amelloides*) in a greenhouse.—(Courtesy Biol. Abs.)

Mercury ammonium silicate as a gladiolus corm treatment, R. P. WHITE (*Phytopathology*, 24 (1934), No. 10, pp. 1122-1124).—A mercury ammonium silicate gel prepared by the action of a solution of mercuric bichloride on a mixture of ammonium hydroxide and sodium silicate, the proportions of which are not indicated, proved highly efficacious in the control of gladiolus scab [*Bacterium marginatum*] at the New Jersey Experiment Stations, and gave promising results in the control of *Penicillium gladioli*.—(Courtesy Biol. Abs.)

The bulbous irises as hosts of Tylenchus dipsaci, the bulb or stem nema, G. STEINER and E. M. BUHRER (*Phytopathology*, 23 (1933), No. 1, pp. 103-105, figs. 2).—The occurrence of this pest on 22 varieties of Spanish, Dutch, English, and Morocco iris from Canada, England, France, Netherlands, Florida, North Carolina, Oregon, South Carolina, Virginia, Washington, and Wisconsin is reported. Attempted transfer to narcissus and onion failed. The effect of hot-water treatment on the iris plant was unsatisfactory.

The effect of mosaic on bloom production of the Talisman rose, R. P. WHITE (*Phytopathology*, 24 (1934), No. 10, pp. 1124, 1125).—In work by the New Jersey Experiment Stations, a thorough examination of a sample lot of young potted Talisman roses ready for benching did not result in the recognition and complete elimination of all mosaic-infected plants. Production records on diseased and healthy plants over a period of 2 yr. showed that mosaic infection had relatively slight influence on the production of this variety, contrary to the effects on the variety Madame Butterfly, which had been observed to produce less than 25 percent normal blooms.

A fungus gall on Viburnum mistaken for crown gall, N. A. BROWN (*Phytopathology*, 24 (1934), No. 10, pp. 1119, 1120, fig. 1).—Galls $\frac{1}{4}$ in. to more than 1 in. in diameter occurring on *V. opulus* have been a subject of unsuccessful inquiry as to their origin for over 10 yr. The crown gall organism could not be isolated. The U. S. D. A. Bureau of Entomology could find no insect responsible. Isolations by the author from galls, followed by successful inoculations into *Viburnum*, however, proved that the disease was caused by a *Phomopsis*, the species of which has not yet been determined.—(Courtesy Biol. Abs.)

Summary of results of recent experiments to control pecan rosette with zinc sulphate, J. B. DEMAREE, E. D. FOWLER, and H. L. CRANE (*Southeast. Pecan Growers Assoc. Proc.*, 28 (1934), pp. 29-37).—The results of 2 yr. of work are summarized showing the successful use of zinc sulfate as a remedy for pecan rosette. The material was applied (1) by spraying the foliage at 2-4-week intervals with a 0.25-percent solution, (2) by inserting the dry salt, in early spring, into holes bored into the trunks, and (3) by early spring soil applications. Spraying gave the quickest results and prevented the development of rosette entirely, if persisted in. Response from soil applications was

more variable. Excellent response was made to the introduction of the zinc sulfate into the trunks. This effect was carried over into the next season.

Some injurious effects of bordeaux mixture on pecan trees, J. B. DEMAREE and J. R. LARGE, JR. (Southeast. Pecan Growers Assoc. Proc., 28 (1934), pp. 20-29).—Experiments in Georgia and Florida pecan orchards extending over a 16-year period showed that while bordeaux mixture was the most dependable fungicide for controlling pecan diseases, it produced the greatest danger of foliage injury (1) to very young pecan foliage, causing severe burning of the margins and tips of leaflets and stopping leaf growth; (2) infrequently to older foliage in June or July, causing small spots and burned margins or tips, with subsequent dropping of older leaflets; and (3) under drought conditions in summer or early fall, when it seems to increase transpiration to the point where disastrous defoliation may result. This may occur soon after the spray is applied, if soil moisture is lacking at that time, or may not become evident for 6 weeks or 2 mo., if drought is delayed. On account of the frequent occurrence of late-summer droughts, pecan spraying with bordeaux mixture in the Southeast is considered a hazardous practice.

European canker of black walnut and other trees, J. M. ASHCROFT (West Virginia Sta. Bul. 261 (1934), pp. 52, pls. 7).—This disease, due to *Nectria galligena*, is described as it appears on *Juglans nigra*. It was found also on *Acer rubrum*, *Liriodendron tulipifera*, *J. cinerea*, *Quercus rubra*, *Q. alba*, *Q. velutina*, and *Hicoria glabra*, this report probably being the first for the last named five. It was found on black walnut in 50 counties of West Virginia and has been reported from 8 other States and from 1 Canadian Province.

The pathological anatomy on black walnut is described. The fungus was found to be intercellular in the extracambial tissues, but entirely intracellular in the xylem.

The taxonomic situation relative to canker-causing *Nectrias* and closely related species is discussed in detail. Spore size is held of no value as a means of dividing into species and varieties the *Nectrias* responsible for canker of deciduous trees. Cross inoculations indicated no clear-cut host specialization among the isolates from the different tree species.

Certain morphological characters for distinguishing canker-causing organisms from closely related species are described. The author considers that the forms associated with cankers on the above-mentioned host species are all referable to *N. galligena*.

Summer temperatures in West Virginia, if sufficiently prolonged, were found high enough to kill the canker fungus. Short daily exposures to such temperatures were cumulative in their effect on the parasite.

A contribution to the biology of *Fomes pini* (Thore) Lloyd (Trametes pini [Thore] Fries), W. C. PERCIVAL (N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 40 (1933), pp. 72, figs. 21).—Fifty-nine host species are listed. The fungus was never found outside the heartwood. Spring and fall peaks in sporulation were found when temperatures rose above 50° F. after a cool spell. Continuous temperatures above 50° resulted in the development of a new tube layer. Spore germination was best between 5.0 and 6.0 pH. Mycelial growth, however, occurred over a wide pH range and from 6° to 30° C., 25° being the optimum. *Picea rubra* wood was rotted by cultures from *Pinus strobus* and *P. monticola*. Different types of decay produced by the fungus were found due entirely to differences in the host.

Studies in the decomposition of timber under industrial conditions.—I, Greenheart; II, The decay of greenheart; III, Pitchpine; IV, Extensive wet rot; V, Dry rot, E. A. RUDGE (Jour. Soc. Chem. Indus., Trans., 52 (1933),

Nos. 36, pp. 283T-285T, figs. 2; 51, pp. 447T-449T; 53 (1934), Nos. 3, pp. 22T-24T, fig. 1; 6, pp. 37T, 38T; 38T-40T, figs. 2).—The author presents in this series of articles the results of chemical analyses of various kinds of wood, some of which have been subjected to conditions favoring decay. It is held that the data obtained indicate that there is an ionic intrusion into the woody tissue of inorganic matter, especially calcium, much of which is found associated with the cellulose, and that this causes disintegration of the wood structure to begin prior to the incidence of fungus growth. The author considers, in fact, that extensive development of all the characters of wood rot may occur quite independently of biological action in many instances.

Blue stain in *Pinus radiata* (insignis) timber: Some preliminary experiments with case stock, J. E. CUMMINS (*Jour. Council Sci. and Indus. Res. [Aust.]*, 6 (1933), No. 4, pp. 244-252, pl. 1, fig. 1).—In experiments for the prevention of blue stain 1,500 freshly sawed *P. radiata* boards were immersed 5 sec. in Lignasan or in soda solutions. After 9 weeks 71 percent of the surface of the untreated, 40 percent of the soda-treated, and none of the Lignasan-treated boards were blue stained in the "lap" stacks. Treatments did not prevent surface mold. The average moisture content was 30 percent for the lap stacks and 20 percent for the "strip" stacks. The drier condition of the latter resulted in less mold and blue stain.

Some plant-parasitic nemas, with description of three new species, G. THORNE (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 8, pp. 755-763, figs. 7).—*Anguillulina pratensis* was found to be the causal agent of a destructive root disease of figs in California. Symptoms and known distributions are discussed.

Morphological descriptions, detailed drawings of the parasites, and descriptions of the disease symptoms produced are given for *A. pustulicola* n. sp., parasitic on the stems of an unidentified grass from Mexico; *A. phyllobia* n. sp., infesting *Solanum elaeagnifolium* in Arizona; and for *Neotylenchus obesus* n. sp., found inhabiting lesions on alfalfa crowns in Colorado.

Studies on certain environmental relations of the root-knot nematode, *Heterodera radicola*, G. H. GODFREY and H. M. HOSHINO (*Phytopathology*, 23 (1933), No. 1, pp. 41-62, figs. 4).—The longevity of larvae and eggs was determined under different conditions of moisture, ultraviolet radiation, sunlight, and heat, both when enclosed in plant tissues and free.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Warm-blooded vertebrates (*New York: Smithsn. Inst. Ser., Inc., 1931, pp. [11]+389, pls. 125, figs. 25*).—Part 1 of this popular work, issued as volume 9 of the Smithsonian Scientific Series, relates to birds, by A. Wetmore (pp. 1-166), and part 2 to mammals and how they are studied, by G. S. Miller, Jr., and J. W. Gidley (pp. 167-375).

Wildlife conservation (*U. S. Dept. Agr., Sec. Agr. Rpt., 1934, pp. 74-76*).—The areas acquired or in process of acquisition on August 6, 1934, through use of emergency funds are listed, and the scope of wildlife conservation discussed.

Officials and organizations concerned with wildlife protection, 1934, compiled by F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 211 (1934), pp. 14*).—The thirty-fourth edition of this directory (*E. S. R.*, 70, p. 354).

Wild animals in and out of the Zoo, W. M. MANN (*New York: Smithsn. Inst. Ser., Inc., 1930, pp. [15]+362, pls. 101, figs. 15*).—A popular account, issued as volume 6 of the Smithsonian Scientific Series, presented in 22 chapters and 2 appendixes.

Information on the biology of the reindeer and on reindeer husbandry in the northeastern section of the Malaya Zemlya tundra [trans. title], V. M. SDOBNIKOV (In *Olen'i pastbishcha severnogo kraia*, II. Leningrad: Akad. Nauk S. S. S. R., 1933, Sborn. II, pp. 185-229, fig. 1).—This contribution reports on (1) the feeding habits of the reindeer—the effect of temperature, rain, and other factors, pointing out the peculiar craving for human urine at certain periods; (2) the relation of the insect attacks (*Cephenomyia nasalis* and *Oedemagena tarandi*) to the behavior of the animals, feeding and their general condition, the habits of the animals with respect to defense against these insects, the mode of attack by these and other insects, and methods of control; (3) the breeding of reindeer; (4) hoof disease; (5) the system of movement of herds from place to place; (6) the role of dogs in the herd management; (7) castration; and (8) the utilization of the animals as load carriers. A table is given on measurements made of reindeer of different ages, which includes various parts of the body, pulse rate, etc.

Winter food habits of coyotes.—A report of progress, 1933, C. C. SPERRY (*Jour. Mammal.*, 15 (1934), No. 4, pp. 286-290, fig. 1).—This is a progress report on the food habits of coyotes based upon an examination of 2,584 stomachs collected in 10 Western States during December, January, and February 1931 to 1934 (*E. S. R.*, 70, p. 60).

On competition between species: Mutual relations between the squirrel (*Sciurus vulgaris* L.), the crossbill (*Loxia curvirostra* L.), and the great spotted woodpecker (*Dryobates major* L.) [trans. title], A. N. FORMOZOV (*Dok. Akad. Nauk S. S. S. R. (Compt. Rend. Acad. Sci. U. R. S. S.)*, 3 (1934), No. 3, pp. 197-201; *Eng. abs.*, pp. 199-201).—A report of observations of certain mutual relations between three of the usual inhabitants of the northern forest in the U. S. S. R. The observations were made in the environs of Moskva (Moscow), chiefly in the Sharynsk district of the Gorki Region during the course of field work on the ecology of *S. vulgaris*.

Our garden birds: Their food, habits, and appearances, H. M. BATTEN (*London: T. Nelson & Sons*, [1934], pp. 192, pls. 39, [figs. 6]).—A popular account.

Study of artificial incubation of game birds, I, II, A. L. ROMANOFF ([*New York*] *Cornell Sta. Bul.* 616 (1934), pp. 39, figs. 26).—This contribution deals with the subject in two parts.

I. Temperature requirements for pheasant and quail eggs (pp. 5-22).—It was found that the temperature requirements for the incubation of pheasant and quail eggs are radically different. "The most efficient temperature for the incubation of pheasant eggs, at given experimental conditions in respect to other environmental (physical) factors, would be 102° F. at the first period, 101° at the second period, and 100° or lower at the third, or concluding, period of incubation. The most efficient temperature for the incubation of quail eggs, at given experimental conditions in respect to the other environmental (physical) factors, would be 101° throughout, or even slightly raised toward the end of incubation. For the pheasant eggs there is greater danger in the variation of temperature during the first and the second periods than during the third, or last, period of incubation, when the incubation temperature may be considerably lowered with beneficial effect to the embryo and to the final hatch. For the quail eggs there are much narrower limits of high and low temperature during the first and the second periods than during the third, or last, period of incubation, when the temperature may be slightly raised with beneficial effect to the embryo and to the final hatch."

II. *Humidity requirements for pheasant and quail eggs* (pp. 23-39).—It was found that "humidity is a very specific factor in the incubation of pheasant and quail eggs. . . . At constant temperature and air circulation, pheasant eggs require higher humidity at the beginning and lower at the end of incubation, that is, falling from about 75 percent relative humidity to 65 percent. At constant temperature and air circulation, quail eggs require somewhat lower humidity at the beginning and higher at the end of incubation, that is, rising from about 65 percent relative humidity to 75 percent. The ranges in humidity condition within which it is possible to get a good hatch are much narrower for quail than for pheasant eggs; that is, an improper humidity is more injurious to quail eggs than to pheasant eggs."

Blackbirds and orioles, A. A. ALLEN (*Natl. Geogr. Mag.*, 66 (1934), No. 1, pp. 111-130, pls. 8).—This is the eighth article, illustrated by paintings by A. Brooks, in the series describing the bird families of the United States and Canada (*E. S. R.*, 71, p. 664).

Far-flying wild fowl and their foes, A. BROOKS (*Natl. Geogr. Mag.*, 66 (1934), No. 4, pp. 486-528, pls. 16, figs. 6).—This contribution, illustrated with paintings by the author, is the ninth article in the series above noted.

[*An efficient and cheap starling trap*], G. P. VAN ESELTINE (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, pp. 1, 10, figs. 2).—Following a brief discussion of the economic importance of the starling, in which the loss caused by it during the cherry and grape season is emphasized, a description and a diagram are given of a trap originally employed at the Ontario Agricultural College.

"The trap is 9 ft. square on the ground and the lower part is 5 ft. high. This lower part is made of four separate sections held together by bolts and wing nuts. The upper part is made of three separate sections each 2.5 ft. high. These are attached by hooks and eye bolts to the lower part. Each section is covered with 0.75- or 1-in. wire mesh. A space of 3 in. is left open between the center top section and each side top section, except for 8 in. at each end where the screen projects across these openings. Narrow strips are nailed at intervals down the sides of the top section to provide perching places for incoming birds. The frame is made entirely of 2-in. strips."

The trap is set without the top pieces and baited with grain, cull apples, or kitchen scraps. After a few days, when the birds have become used to feeding, the top pieces are put on. Large flocks are said to have been captured in the trap in winter.

New experimental hosts for Brachylaemus virginiana (Dickerson) Krull, W. H. KRULL (*Jour. Wash. Acad. Sci.*, 24 (1934), No. 11, pp. 483-485).—Experiments have shown that the fluke *B. virginiana*, normally parasitic in the opossum, may parasitize the dog, cat, chicken, and white rat, mature flukes having been found in these hosts.

Report of the Chief of the Bureau of Entomology, 1934, L. A. STRONG (*U. S. Dept. Agr., Bur. Ent. Rpt.*, 1934, pp. 1-12, 16-20).—The work of the year (*E. S. R.* 70, p. 498) relating to insects affecting man and animals includes findings noted as to large-scale mosquito control, carried on under the authority of the Civil Works Administration; saltmarsh sand flies in Georgia; and screwworm infestation of livestock in Georgia and Florida.

Data as to the Japanese beetle and Asiatic beetle, bacteriological work on *Bacillus alvei* and *B. para-alvei*, introduction work with the oriental fruit moth parasites, Japanese and Asiatic beetle parasites, and shipments of parasites made to foreign countries are given.

Insects attacking cotton plants considered include the bollweevil and its control by arsenicals and parasites (*Microbracon mellitor*, *Eurytoma tylodermatis*, and *Catolaccus hunteri*), control of the pink bollworm by cultural methods and parasites (*M. brevicornis* and *Exeristes roborator*), and control of the cotton flea hopper, bollworm, and Thurberia weevil. Forest insects for which data are reported include bark beetles, particularly the European elm bark beetle *Scolytus multistriatus*.

In the field of cereal and forage insects work with grasshoppers, the Mormon cricket, chinch bug, sugarcane insects (the sugarcane beetle and a new vector of cane mosaic, *Aphis bituberculata*), white grubs, a new alfalfa pest (*Brachyrhinus ligustici* L.) established in New York State near Oswego, and the widely distributed corn flea beetle which carries the organism of Stewart's disease of corn is considered. Rotenone-bearing plants, tobacco and nicotine, and arsenicals were studied. Truck crop and garden insects worked with are wireworms, the Mexican bean beetle, pea aphid, beet leaf hopper, sweetpotato weevil, celery leaf tier, pepper weevil, raspberry fruitworm, *Tarsonemus* mites in the greenhouse, also an apparatus for burning sulfur in combating mushroom insects.

Fruit and shade-tree insect work noted includes codling moth control; parasite control of the oriental fruit moth, particularly by *Macrocentrus ancylivorus*, and bait trap control; and orange thrips. The fruit fly work includes that with the Mexican fruit fly, Mediterranean fruit fly in Hawaii, attempts to eradicate two species of West Indian fruit flies (*Anastrepha acidusa* Walk. and *A. suspensa* Loew) from the island of Key West, and occurrence of *A. suspensa* in Puerto Rico.

Flour-mill and grain insects, particularly the Mediterranean flour moth; insects affecting dried fruits; the pea weevil, a serious pest in the Northwest; insects attacking cured tobacco in warehouses and their control by the use of light traps; and the value of fumigable storage for furs and clothing and moth-proofing solutions in combating household insects are also considered.

Insect pests (*U. S. Dept. Agr., Sec. Agr. Rpt., 1934, pp. 96-98*).—Following a brief reference to the occurrence of the more important insects of the year (*E. S. R.*, 70, p. 647), mosquito-control campaigns, the transfer of the elm disease fungus by bark beetles, and the occurrence of the Japanese beetle in St. Louis, Mo., are considered more at length.

[Control work with insect pests by the Bureau of Plant Quarantine] (*U. S. Dept. Agr., Bur. Plant Quar. Rpt., 1934, pp. 2-34, 67, 68*).—The control work of the year ended June 30, 1934, continuing that previously noted (*E. S. R.*, 70, p. 560) includes that with the gypsy moth and brown-tail moth, Japanese beetle, European corn borer, pink bollworm, Thurberia weevil, Mexican fruit fly, other species of *Anastrepha*, and the Parlatoria date scale. The work of the technological division is briefly referred to, including a description of a cottonseed sterilizer, the fumigation of baled cotton, and analyses of soil for lead arsenate.

[Contributions on insect and rodent control in California] (*Calif. Dept. Agr. Mo. Bul.*, 23 (1934), No. 7-9, pp. 185-195, 201-209, figs. 3).—Among the contributions presented are the following: Back-Crawling Scarabaeid Grubs (*Potosia affinis* Anderesch) Intercepted in Quarantine at San Francisco, by P. C. Ting (pp. 185-191); Rodent Control with Sodium Fluosilicate by a New Method, by D. B. Mackie, W. C. Jacobsen, and W. B. Carter (pp. 192-195); The Silver or Rust Mite (*Phyllocoptes oleivorus* (Ashm.)) in San Diego County, by W. S. Binney (pp. 201-203); Insect Pests of Dried Fruits (pp. 204-206);

and Some Predatory Habits of the Orange Bagworm *Platoeceticus gloverii* Packard, by H. K. Plank and A. W. Cressman (pp. 207-209).

[Contributions on economic insects] (*Calif. Dept. Agr. Mo. Bul.*, 23 (1934), No. 10-11, pp. 248-252, 265-268, 298-303, 328-338).—The contributions presented at the fifteenth and sixteenth annual conferences of the Western Plant Quarantine Board, held, respectively, in Salt Lake City, Utah, June 12-14, 1933, and in Salem, Oreg., June 19-21, 1934, include the following: The Fruit Fly Situation in Mexico, by E. Coppel Rivas (pp. 248-250); Résumé of the Tuber Moth Situation, by D. B. Mackie (pp. 250-252); Can Arizona Continue to Keep Her Agricultural Products Pest Free? by C. Campbell (pp. 265-267); Can Tropical Insects Accommodate Themselves to Colder Zones? by W. H. Lyne (pp. 267, 268); The Present Status of the European Earwig, by R. E. Dimick (pp. 298-300); Treating Balled Nursery Stock to Destroy Earwig, by D. B. Mackie (pp. 300-303); Observations on the Life Habits of *Cnephasia longana* Haw., by W. D. Edwards, K. Gray, and D. C. Mote (pp. 328-333); Changes in Insect and Pest Legislation in Canada, by L. S. McLaine (pp. 333-335); The Alfalfa Weevil—Its Economic Importance Over Estimated, by W. H. Wicks (pp. 335-337); and Fruit Fly Situation in Mexico, by E. Coppel Rivas (pp. 337, 338).

[Work with economic insects at the California Station] (*California Sta. [Bien.] Rpt.* 1933-34, pp. 60, 61, 62, 63, 73, 74, 76).—Brief reference is made to results of life history and control studies of the omnivorous looper, amorbia moth, avocado brown mite, and the latania scale, enemies of the avocado; the walnut husk fly and codling moth as pests of the walnut; the value of tank mixture oil sprays for control of deciduous fruit insects; the use of a light trap in field and warehouse; pear thrips control; work with the mealy plum aphid; and pyrethrum-oil sprays for adult grape leaf hoppers.

[Contributions on economic insects] (*Iowa State Hort. Soc. Rpt.*, 68 (1933), pp. 33-39, 73-82, 135-141).—The following are among the contributions here presented (E. S. R., 71, p. 667): The Honeybee and Fire Blight, by F. C. Pellett (pp. 33-39); Spray Residues on Fruits and Vegetables, by C. H. Richardson (pp. 73-82); Controlling Codling Moth by Spraying, by W. P. Flint (pp. 135-139); and Codling Moth Discussion, by C. H. Richardson (pp. 139-141).

[Report of work with economic insects and acarids at the New York State Station] (*New York State Sta. Rpt.* 1934, pp. 28, 29, 42-52).—The work of the year referred to (E. S. R., 70, p. 803) includes that with control of red mites on raspberries; attacks of the potato and spinach aphids by *Empusa aphidis* Hoffm.; the codling moth; biological control of the oriental fruit moth and peach tree borer; cabbage insects; cherry fruit fly; pea aphid; tar distillate sprays; apple insects in eastern New York, including the rosy apple aphid, rose leaf beetle, white apple leaf hopper, and apple curculio; the European corn borer; corn ear worm; vegetable insects on Long Island, including cabbage worms, potato insects, and the corn ear worm; and insects affecting nursery stock, ornamentals, and raspberries, including the common red spider on raspberries, gladiolus thrips, spruce gall aphid, and root weevils affecting conifers (the strawberry root weevil and the black vine weevil).

Control of insect pests (*West Virginia Sta. Bul.* 263 (1934), pp. 19, 21-23, fig. 1).—The work of the biennium referred to (E. S. R., 68, p. 780) includes that with lead arsenate substitutes in codling moth control, bait pails and bands to trap codling moths, aphid control by sprays containing cresylic acid to replace lime-sulfur, pistol casebearer control by oil-spray combinations

applied in the spring to replace summer applications, stationary spray systems in the State, and Mexican bean beetle control.

[Report of the entomology and apiculture department of the Wyoming Station] (*Wyoming Sta. Rpt. 1934*, pp. 20-23).—The work of the year referred to (E. S. R., 70, p. 812) includes that on wintering bees and the results of work at the Intermountain States Bee Culture Field Laboratory in cooperation with the U. S. Department of Agriculture, particularly the relation between colony populations and their production of honey.

Report on entomological section, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 3 (1934), No. 2, pp. 16-19).—The results of the mass rearing and liberation of *Trichogramma minutum* in the reduction of the sugarcane borer (see p. 669) and work with the sugarcane root borer *Diaprepes abbreviatus* and the brown hardback *Phytalus smithi* are reported upon.

[Report of studies of economic insects in Puerto Rico] (*Jour. Agr. Univ. Puerto Rico*, 18 (1934), No. 3, pp. [3]+411-441, pl. 1, figs. 6).—The contributions here presented are as follows: Paring and Heat Sterilization of the Corms to Eliminate the Banana Root Weevil (*Cosmopolites sordidus* Germar), by F. Seín, Jr. (pp. 411-416); and The Diapause Portion of the Larval Period of *Diaprepes abbreviatus* L. (pp. 417-428), Lima Bean Pod-Borer Caterpillars of Puerto Rico on Their Wild Hosts (pp. 429-434), The Larvae of *Lycaena theonius* Lucas Feed on Buds and Flowers of Lima Bean and *Crotalaria incana* in Puerto Rico (p. 435), and The Present Status of White Grub Parasites in Puerto Rico (pp. 436-441), all by G. N. Wolcott.

Control of insect pests (*Imp. Col. Trop. Agr. [Trinidad]*, *St. Lucia Agr. Dept. Res. Abs. Rpt.*, 1933, pp. 11-13).—Work of the year with scale insects, particularly the purple scale on young grapefruit and orange trees in the orchards, the citrus leaf mite, root borers, and cane borers, *Diatraea* spp., are briefly considered.

Annual report of the entomologist for 1933, H. M. MORRIS (*Cyprus Dept. Agr. Ann. Rpt.*, 1933, pp. 43-47).—The occurrence of and work with locusts and other insect pests are reported.

[Lists of publications in Indian entomology, 1930-32] *Imp. Council Agr. Res. [India]*, *Misc. Buls.* 1 (1934), pp. 45; 2 (1934), pp. 27; 3 (1934), pp. 36).—These lists, followed by subject indexes, are in continuation of those previously noted (E. S. R., 65, p. 547).

Insect phototropism and its economic importance in India, T. V. RAMAKRISHNA AYYAR and K. P. ANANTANARAYANAN (*Madras Agr. Jour.*, 22 (1934), No. 8, pp. 268-273).—This contribution is presented in connection with a list of 11 references to the literature.

Report of the entomologist for 1933, C. B. R. KING (*Tea Res. Inst. Ceylon Bul.* 11 (1933), pp. 26-30).—A brief report is made of the occurrence of and control work of the year with economic insects.

Report of the acting entomologist, 1933, W. V. HARRIS (*Tanganyika Dept. Agr. Ann. Rpt.*, 1933, pp. 69-75).—This report relating to the work in 1933 (E. S. R., 70, p. 61) considers locusts; coconut, coffee, and cotton pests; termites; apiculture; etc.

Report of the Government entomologist for 1933, H. HARGREAVES (*Uganda Dept. Agr. Ann. Rpt.*, 1933, pt. 2, pp. 45-47).—The occurrence of and control work with the insects of the year are reported upon, together with information on beekeeping (E. S. R., 71, p. 68).

[Report of work with economic insects in Mauritius], A. MOUTIA (*Mauritius Dept. Agr. Ann. Rpt.*, 1932, pp. 43-51).—This is a report of the campaign

against *Phytalus smithi* Arrow, including natural and artificial measures; the cane borer *Diatraea venosata* Wlk.; insect pests of pigeon peas, *Cajanus indicus*; fruit flies, *Dacus ciliatus* Lwe. and *Tridacus d'emmerezi* Bez.; the lawn cutworm, *Crambus emmerezellus* Joan.; the mango cecidomyid fly, *Procon-tarinia matteiana* Kieff.; and other pests.

[Report of the] entomological division, A. MOUTIA (*Mauritius Dept. Agr. Ann. Rpt.*, 1933, pp. 25-29).—This is a report of a campaign against *Phytalus smithi* Arrow, followed by an account of the occurrence of and control work with other economic insects, including the red winged locust (*Nomadacris septemfasciata* Serv.), two cucurbit flies (*Dacus emmerezi* Bez. and *D. ciliatus*), lawn cutworm (*Crambus emmerezellus* Joan.), termites, *Chrysomphalus ficus* Ashm., coconut scale (*Aspidiotus destructor* Sign.), pineapple mealybug, oriental fruit moth on peach, and several other pests.

Records of some new insect pests, W. B. GURNEY (*Agr. Gaz. N. S. Wales*, 45 (1934), No. 8, pp. 452-454, figs. 2).—The European earwig is recorded from the Australian mainland for the first time, although previously having appeared in New Zealand and Tasmania. The occurrence of the black beetle *Heteronychus arator* F., Fuller's rose beetle, and *Phyllotocidium macleayi* Blackb. is also reported.

The introduction, increase, and control of various insect pests, L. J. NEWMAN (*Jour. Dept. Agr. West. Aust.*, 2. ser., 11 (1934), No. 2, pp. 201-206).—This contribution deals with the Mediterranean fruit fly, black scale, lucerne flea or clover springtail (*Sminthurus viridis*), and some 13 other insects of particular importance in Western Australia.

Insecticidally induced immunity in plants to sucking insects, D. M. DELONG (*Science*, 80 (1934), No. 2075, pp. 320, 321).—Evidence is presented, based upon work with the potato leaf hopper, indicating that an induced immunity in plants may result from the application of sulfur compounds much similar to that from bordeaux mixture and other copper compounds. Reference is made to a similar finding by List and Daniels, working with the potato psyllid *Paratrioza cockerelli* Sulc. in Colorado (*E. S. R.*, 71, p. 221).

"Although insoluble when placed upon the plant tissue, these materials in some way either cause the plant to produce abnormal quantities of a toxic material which may possibly be produced normally by the plant only in minute quantities, or the chemical effect upon the plant may be direct by causing the character of the sap to change remarkably and the general rate of metabolism to change by the presence of extremely small amounts of the insecticide which has been absorbed in some form by the plant. Experimental work has given evidence of both possibilities."

Penetration of gaseous pyridine, piperidine, and nicotine into the bodies of certain insects, C. H. RICHARDSON, L. H. GLOVER, and L. O. ELLISOR (*Science*, 80 (1934), No. 2064, pp. 76, 77).—The results of the experiments here mentioned are said to leave little doubt that these organic bases in gaseous condition passed directly through the cuticula of the insects, including adult American cockroaches, larvae of the corn ear worm, and adult red-legged grasshoppers. The compounds have been detected, and the amounts quantitatively estimated, in muscular tissue from the wings and legs, in the entire digest tracts, in fat body tissue, and in the ventral nerve cords of cockroaches, and in the blood of corn ear worm larvae which have been subjected to the gases.

Toxicity of cadmium to chewing insects, J. M. GINSBURG (*Science*, 80 (1934), No. 2073, p. 269).—In insecticide tests at the New Jersey Experiment Stations cadmium phosphate was found to possess appreciable toxicity to silk-

worm larvae. Cadmium oxide and cadmium hydroxide were found to rank very high in toxicity and compared well with lead arsenate.

Cadmium hydroxide was tested against three different species of chewing insects that were available in the greenhouse. Two eastern tent caterpillar nests on an infested apple tree that was sprayed on May 18 with a mixture consisting of 3 lb. of cadmium hydroxide, 4 lb. of lime, 1.5 lb. of skim milk, and 100 gal. of water had a mortality of about 90 percent after 3 days, with the remaining individuals apparently sick and not feeding. Eastern "tent caterpillars" transferred on apple twigs previously sprayed with cadmium hydroxide in concentrations of 1, 2, 3, and 4 lb. to 100 gal. of water showed percentage kill after 48 hr. at the rate of 70, 90, 100, and 100, respectively. Considerable feeding took place during the first day and very little during the last day. About 82 percent of the silk moth larvae were dead 2 days after they were transferred on mulberry leaves, previously dusted with a mixture of 95 percent talc and 5 percent cadmium hydroxide. Confused flour beetles placed in flour containing 15 percent cadmium hydroxide were found 100 percent dead after 10 days of feeding. Similar results were obtained on these insects with spray and dust mixtures containing cadmium oxide."

Unsaturated petroleum oils as insecticides, W. CARTER (*Science*, 80 (1934), No. 2075, p. 315).—Contributing from the University of Hawaii the author reports that field tests have shown a 1 percent dilution of a concentrated emulsion containing 50 percent of Diesel fuel oils used as weed killers to be adequate for control of the pineapple mealybug on pineapple, and that repeated sprays of from 1 to 4 percent have shown no phytocidal action. In preliminary experiments on citrus an excellent control of the green scale was obtained when a 3 percent dilution was used, and no deleterious effects followed.

Some notes on the lead arsenates, R. P. TUCKER (*Calif. Dept. Agr. Mo. Bul.*, 23 (1934), No. 2-6, pp. 141-145).—The studies here reported relate to the hydrolysis of lead arsenate salts in its possible relationship to dew on the leaves and to the reaction of sodium chloride on dilead arsenate.

[Handbooks of citrus insect control for 1933 and 1934] (*Calif. Fruit Growers Exch., Los Angeles, Buls.* 10 (1933), pp. 4; 11 (1934), pp. [1]+29).—The handbook for 1933, consisting of recommendations for citrus pest control presented in two tables, one for interior districts and the other for the coastal district, is in continuation of those previously noted (*E. S. R.*, 68, p. 498). A brief discussion of bordeaux mixture and winter fumigation is included.

The 1934 edition of the handbook, by R. S. Woglum et al., presents discussions with county programs which, on the basis of experience, have given the most satisfactory results and are the most economical in the long run in subduing citrus insect pests to a degree that will maintain the highest quality fruit. Other methods of control are offered which, though perhaps less dependable, of a more temporary nature, or more severe on the fruit quality, offer a less immediate outlay for those unable to apply the preferred program.

Control of insect pests in stored derris, N. C. E. MILLER (*Malayan Agr. Jour.*, 22 (1934), No. 8, pp. 367, 368).—This brief account relates to several species of beetles that may attack derris in both the larval and adult stages. Complete elimination from infestation can be secured if the root is ground to powder and packed in sealed tins.

The insect inhabitants of carrion: A study in animal ecology, M. E. FULLER (*Aust. Council Sci. and Indus. Res. Bul.* 82 (1934), pp. 62, pl. 1, figs. 2).—Following a brief introduction, historical account, and discussion of methods, the author deals with the insects concerned, seasonal distribution of blowflies,

ecological succession in carrion, competition, the influence of physical factors on the blowfly population, and the effect of parasites, predators, and other insects. A list of 65 references to the literature is included.

Methods of testing the susceptibility of timbers to termite attack, C. DOVER and R. N. MATHUR (*Indian Forest Rec.*, 20 (1934), No. 7, pp. [3]+20).—Following an introduction by C. F. C. Beeson, the authors report upon a survey of the test yard at Dehra Dun, experiments on natural resistance and preservative efficiency, some factors affecting termite exposure tests, and the technic of future tests.

The Dermaptera and Orthoptera of Illinois, M. HEBARD (*Ill. Nat. Hist. Survey Bul.*, 20 (1934), Art. 3, pp. III+125-279, pls. 1, figs. 167).—Following a brief account of the biology and habits of the orders Dermaptera and Orthoptera, ecological factors affecting Orthoptera, a summary of the literature, and collection and disposition of the material, keys are given to the two orders. The Dermaptera of the State (p. 151) represented by 2 families and 3 species and the Orthoptera (pp. 151-259) represented by 191 species and races, with their morphology, correlation, life history, habitat, and distribution, are considered at some length. A 7-page list of references to the literature, an appendix on grasshopper and cockroach control, and an index to subfamilies, genera, and species are included.

Important parasites of the migratory grasshopper *Schistocerca paranensis* Burm. in the Argentine Republic [trans. title] (*Bol. Mens. Min. Agr. [Argentina]*, 34 (1933), No. 2-3, pp. 225-266, pls. 9, figs. 6).—Following a brief introduction, chapter 1 of this contribution dealing with the plant parasites of *S. paranensis*, namely, *Coccobacillus acridiorum*, *Sporotrichum paranense* n. sp., and *Fusarium* sp., is by J. B. Marchionatto (pp. 227-245), and chapter 2, with the insect and other invertebrate parasites of this grasshopper, by E. E. Blanchard (pp. 247-264). The insect parasites of particular importance are *Sarcophaga caridei* Bréth., *Brachycoma acridiorum* (Weyenb.), and the seed-corn maggot.

A list is given of 42 references to the literature.

The Moroccan locust (*Doclostaurus maroccanus* Thunb.) and its infestations in Sardegna (Sardinia) [trans. title], A. MELIS (*Atti R. Accad. Georg. [Florence]*, 5. ser., 30 (1933), No. 3-4, pp. 399-504, pls. 10, figs. 10).—This contribution is presented with an 8-page list of references to the literature.

On the biology of the Mantidae (Orthopt.), R. N. MATHUR (*Indian Forest Rec.*, 20 (1934), No. 3, pp. [2]+25, pl. 1).—Following a brief introduction by C. F. C. Beeson and a discussion of the technic, the author reports upon *Aethalochroa ashmoliana* Westw., *Creoboter urbana* Fab., *Deiphobe* sp., *Haldwania liliputana* Beier, *Hestiasula brunneriana* Sauss., *Hierodula westwoodi* Kirby, and *Rhombodera tectiformis* Sauss. This is followed by a discussion of the habits, the food supply of mantids by S. N. Chatterjee, and parasitism.

A winter study of the onion thrips in California, S. F. BAILEY (*Calif. Dept. Agr. Mo. Bul.*, 23 (1934), No. 2-6, pp. 149-152, fig. 1).—The author's study has led him to conclude that it is inadvisable to attempt any winter control measures for the onion thrips (other than the ordinary clean cultural practices) under the conditions met with when the remaining thrips in the field are so widely scattered, still active, and largely inaccessible.

The artificial feeding of Thysanoptera, K. SAKIMURA and W. CARTER (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 2, pp. 341, 342).—Studies conducted by the authors in Hawaii are said to confirm the more recent evidence that the mouth parts of Thysanoptera are used entirely for sucking. The onion thrips is said to have been successfully reared by feeding it on sucrose solutions contained

in tubes capped with fishskin membranes. The solutions used consisted of 3 percent of cane sugar, to which had been added methylene blue and hematoxylin in varying proportions—0.1 and 0.01 percent of the former and 1 percent of the latter. It was found that larvae in the early stages of the first instar did not survive, probably due to the inability to penetrate the membrane, while older larvae fed freely and transformed to the adult stage. This thrips was also fed successfully on extracts of *Emilia sonchifolia* DC., the wild host of the virus of yellow spot, although preliminary trials of its ability to acquire the virus of yellow spot in this manner failed to show positive results. The object of the dye was to provide visual evidence feeding had actually taken place.

Contributions towards a knowledge of the Thysanoptera of Egypt, IX, H. PRIESNER (*Bul. Soc. Roy. Ent. Égypte*, 27 (1934), No. 1-2, pp. 275-285, pl. 1, figs. 9).—This continuation of the account previously noted (E. S. R., 70, p. 808) includes descriptions of four new species.

Report on the bed-bug, G. W. MONIER-WILLIAMS ET AL. ([*Gt. Brit.*] *Min. Health, Rpts. Pub. Health and Med. Subjs. No. 72* (1934), pp. 46, pls. 2).—This is the report of a committee of six appointed by the Ministry of Health, including an annotated bibliography of 21 pages.

Memorandum on the bed-bug and how to deal with it ([*Gt. Brit.*] *Min. Health Memo. 180 Med.* (1934), pp. 7, pls. 2).—A practical account based upon the work above noted.

The Cercopoidea (Homoptera) of China, Z. P. METCALF and G. HORTON (*Lingnan Sci. Jour.*, 13 (1934), No. 3, pp. 367-429, pls. 7, figs. 2).—This contribution from the North Carolina Experiment Station reviewing the known cercopoid insects of China is presented in connection with a four-page list of references to the literature. Tables for the separation of the subfamilies, tribes, and genera and for many of the species are included. Seventy-three species representing 22 genera are recognized; 3 genera are erected and 20 forms described as new.

The Aphidae of Colorado, III, C. P. GILLETTE and M. A. PALMER (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 2, pp. 133-255, figs. 125).—This third and concluding number of the authors' synopsis of the Aphidae of Colorado (E. S. R., 68, p. 784), contributed from the Colorado Experiment Station, deals with the subtribe Macrosiphina (pp. 134-208), the subfamily Eriosomatinae including the tribes Eriosomatini, Pemphigini, and Fordini (pp. 208-240), the subfamily Hormaphinae including the tribes Cerataphini and Hormaphini (pp. 241-243), and the subfamily Mindarinae including the genus *Mindarus*. A host index (pp. 244-248) and an index to the Aphidae of Colorado (pp. 249-255) are included.

Contributions to a knowledge of the white flies (Aleurodidae) of Egypt, II, H. PRIESNER and M. HOSNY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 139 (1934), pp. 21, figs. 16).—In this continuation of the contribution previously noted (E. S. R., 68, p. 784), following a brief account of *Dialeurodes kirkaldyi* (Kotin.), the jasmine white fly, descriptions are given of three new species under the names *Aleurocanthus zizyphi*, found on trees of *Zizyphus spina christi*; *Aleuroplatus cadabae*, on both sides of leaves of *Cadaba rotundifolia*; and *Bemisia longispina*, on the underside of leaves of *Psidium guajava*.

The beech bark disease: A Nectria disease of Fagus, following Cryptococcus fagi (Baer.), J. EHRLICH (*Canad. Jour. Res.*, 10 (1934), Spec. No., pp. [1]+593-692, pls. 9, figs. 19; also *Arnold Arboretum Contrib.*, No. 7 (1934), pp. 104, pls. 9, figs. 19).—This contribution relates to a disease caused by the sequent activity of the beech scale and the parasitic ascomycetous fungus *N. coccinea* (Pers.) n. var. on the European (*F. sylvatica*) and the American

(*F. grandifolia*) beech. The account includes a somewhat extended report of observations of the beech scale, with the nomenclature, history, and range in Europe and North America, description of the life stages, life history and habits, dissemination and distribution, pathogenic role, and control. A large proportion of the 143 references to the literature listed relates to this insect.

It is pointed out that the first indications of the disease are the appearance of the minute beech scale on the bark of the trunk and branches, with the subsequent development of fruiting bodies of the fungus in the areas previously occupied by this insect. The insect probes the living tissues of the outer bark, extracting protoplasmic materials and causing the death of punctured cells. The shrinkage of groups of killed cells leads to tearing of the periderm, which enables the fungus to initiate infection.

It is concluded that the disease can be controlled on ornamental trees through early eradication of the scale by the use of insecticides. "Control in forest stands should aim first at the salvage of infected, dying, and recently killed timber for the purposes of obtaining the greatest possible return on a rapidly depreciating investment and of preventing the development in the slash of unsanitary conditions conducive to further deterioration in the remaining stand. Second, control should aim at the possibility of combating the insect pathogen with fungal and insect enemies. Third, it should, by forest management, favor beech on broad ridge tops rather than steep slopes, and cull the larger trees in an attempt to produce changes in the environment designed to restrict activity of the pathogens and substitute a younger, less susceptible stand."

Red scale in Palestine (Hemiptera: Coccidae), J. CARMIN and D. SCHEINKIN (*Bul. Soc. Roy. Ent. Égypte*, 27 (1934), No. 1-2, pp. 242-274, pl. 1, figs. 3).—A detailed report is made of studies of the history, methods and technique, biology, and natural control (particularly by *Aphytis chrysomphali* Mercet), of the California red scale in Palestine. Three broods have been differentiated, one in June up to the beginning of August, another at the end of August up to the start of October, and the third, the most noxious one, from November up to the middle of May. The first develops apparently asexually, showing no eggs and no adult males, while the other two develop from eggs and give adult males. The broods coincide well with perfectly fixed growth periods of the plant. The California red scale seems to be biologically controlled in Palestine, the main exterminating agents being *A. chrysomphali* and different fungi. Climatic fluctuations, predators, and mites seem to be of minor importance. The life history of *A. chrysomphali* has been worked out and is described and figured.

A list is given of 70 references to the literature.

A fungus found attacking the red scale in groves (Calif. Citrogr., 19 (1934), No. 12, pp. 362, 363).—Reference is made by W. Ebeling of the California Citrus Experiment Station to the occurrence of an important fungus enemy of the California red scale in Los Angeles and Orange Counties and at Riverside and Corona, where the greatest mortality has occurred. At Riverside emergence of young red scale suddenly decreased about May 1, when they should have been on the increase, and concurrently with this decrease in the number of crawlers was a decrease in the number of adults until about August 1, when practically none were alive on the bark and only about 12 percent were alive on the fruit.

Cycles of abundance of the eastern tent caterpillar (Malacosoma americana Fabr.), T. J. HEADLEE (*New Jersey Stat. Bul.* 579 (1934), pp. 2, fig. 1).—A brief practical account illustrated by a graph covering the years

1913-34. This graph, which is based upon the number of letters of inquiry received each year regarding this pest, shows that within the period from 1913 to 1934, inclusive, there were three peaks of abundance, the first occurring in 1915, the second in 1924, and the third in 1934. The cycles are thus shown to be between 9 and 10 yr. long. The probabilities are that the average cycle is about 10 yr. in length. On the basis of the demonstrated cycles, it is suggested that public work against the eastern tent caterpillar should be carried out the year prior to the year of great abundance.

Varietal factors in cane which may influence extent of oviposition by *D[iatraea] saccharalis* and a possible method for determining varietal susceptibility to borer attack, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 2 (1933), No. 4, pp. 53-59).—The author concludes that the "difference in varietal infestation due to difference in chemotropism for the adult moth [sugarcane borer] is too difficult of measurement and determination to be of practical use, even if it exists to a measurable degree, and that difference in stimulation to oviposition due to specific roughness or smoothness of cane leaves is also so difficult of determination, and from the evidence so far available so very slight, that but little use can be made of it. There is at present no evidence that any variety exists, or could be bred, which would inhibit or sufficiently retard the deposition of eggs on its leaf surface.

"There is, however, evidence that extent of borer infestation is correlated with the percentage of dry matter in the central spike, or leaf spindle, as determined by Dr. Hazelhoff for white top borer of cane in Java [E. S. R., 70, p. 357]. The lower the percentage of dry matter in the leaf spindle, and therefore presumably the softer the cane tissues as a whole, the greater are the chances of survival of newly hatched larvae; hence, the greater the infestation. Conversely, the higher the percentage of dry matter, the fewer larvae succeed in feeding on or penetrating the cane tissues, and, consequently, the greater the larval mortality and the lower the infestation.

"It is suggested, therefore, that this factor of high percentage of dry matter in the leaf spindle is the one which should be made the criterion for determining susceptibility to moth borer attack, and that it should be considered as a desirable quality to breed into canes."

The cotton worm, *Prodenia litura* F., in Egypt, I. BISHARA (*Bul. Soc. Roy. Ent. Égypte*, 27 (1934), No. 3, pp. 288-420, pls. 11, figs. 43).—An extended account is given of studies conducted on the morphology, biology, economic importance, natural enemies, and control measures for *P. litura*, one of the most troublesome insects with which the Egyptian farmer has to deal. It feeds on a great variety of plants, but since it is most abundant in summer, cotton is the crop mostly affected. It is said to be exceeded in importance as a pest only by the pink bollworm and *Earias insulana*. A chronological summary of cotton worm attacks during the last 21 yr., compiled from the inspectors' reports, is presented in an appendix. Plates illustrating the stages in the life of this cotton worm and of a number of its natural enemies are presented in colors.

Codling moth control: Results of experiments, 1933-34, R. T. M. PESCOTT (*Jour. Dept. Agr. Victoria*, 32 (1934), No. 10, pp. 503-516, figs. 14).—Experimental control work with the codling moth carried on in continuation of that previously noted (E. S. R., 70, p. 810) is reported, the details being given in tabular form. There was found to be a decided advantage where white oil emulsion sprays replaced the last two arsenate of lead sprays. "When nicotine sulfate was used with white oil emulsion sprays, either in the last spray only or in the last two sprays, a good measure of control resulted.

... Where arsenate of lead sprays were used alone throughout the spray program, the residue at picking time in all cases was above the limit prescribed by law. Where white oil emulsion sprays were substituted in the spray programs after the initial arsenate of lead calyx sprays, the arsenic residue of the fruit at picking time was in all cases below the limit. This has confirmed the results obtained in previous years at Harcourt."

The codling moth (*Carpocapsa pomonella* L.) (*La Pyrale des pommes* (*Carpocapsa pomonella* L.)). Rabat [Morocco]: Dir. Gén. Agr., Com., et Colon., Serv. Défense Vég., 1933, pp. [5]+16, pl. 1).—The first part of this contribution deals with the geographical distribution, morphology, and biology of the codling moth (pp. 1-8) and part 2 with means of control (pp. 8-14); part 3 consists of a list of its natural enemies (pp. 15, 16).

The European corn borer in Vermont, H. L. BAILEY (*Vt. Dept. Agr., Insect Control Div. Circ. 10* (1934), pp. 4, figs. 2).—A brief practical account of the European corn borer and control measures applicable in Vermont.

Two caterpillar pests of citrus, J. C. HUTSON (*Trop. Agr. [Ceylon]*, 83 (1934), No. 3, pp. 188-193, pls. 2).—The citrus leaf miner (*Phyllocnistis citrella* Stt.) and the citrus leaf roller (*Psorosticha zizyphi* Stt.), both pests of young citrus plants, are here considered, the nature of their work and life stages being illustrated by colored plates.

The coconut caterpillar, *Brassolis sophorae* L. (Lep. Brassolidae) in British Guiana, L. D. CLEARE and F. A. SQUIRE (*Agr. Jour. Brit. Guiana*, 5 (1934), No. 3, pp. 166-199, pls. 5, figs. 8).—A report is made of studies of the bionomics, natural enemies, and means of repression of *B. sophorae*, the most damaging insect enemy of coconut on the coast lands of British Guiana. A list of 25 references is included.

Serological studies of moth proteins with special reference to their phylogenetic significance, S. MARTIN and F. B. COTNER (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 3, pp. 372-383).—Serological studies (precipitin reaction) were made by the authors of 14 genera and 20 species of moths of the family Phalaenidae, and reactions were also run of specimens from the families Sphingidae and Nymphalidae. A list is given of 16 references to the literature.

Preliminary catalog of the economically important Lepidoptera of Argentina [trans. title], P. KÖHLER (*Bol. Min. Agr. [Argentina]*, 36 (1934), No. 1, pp. 25-46).—On hundred and thirty-five forms are listed, and so far as known their habitat, food, generations, biology, and importance noted.

The biology of *Stegomyia* under laboratory conditions, I, II (*Ent. Soc. Wash. Proc.*, 36 (1934), No. 7, pp. 185-242, figs. 14).—In part 1 of this contribution the analysis of factors which influence larval development is considered by R. C. Shannon and P. Putnam (pp. 185-216), and in part 2 the egg-laying capacity and longevity of adults, by P. Putnam and R. C. Shannon (pp. 217-242).

The permanence of paris green on the surface of mosquito infested stagnant pools [trans. title], A. DE BENEDETTI (*Riv. Malariol.*, 13 (1934), No. 2, pp. 211-216; *Eng. abs.*, p. 216).—In experiments conducted it was found that paris green, mixed at the rate of 2 percent with earth prepared according to the author's method, persists on the surface of standing waters and shows larvicidal power for at least 24 to 25 days after the application.

Three years mosquito control work in Calcutta, R. SENIOR WHITE (*Bul. Ent. Res.*, 25 (1934), No. 4, pp. 551-596, figs. 10).—In this contribution notes are given on the bionomics of 44 of the 46 species of the family Culicidae now known to occur in the city of Calcutta. It is said that 97 percent of the total

collection is made up of 9 species only, *Culex fatigans* outnumbering all other species. A 3-page list of references to the literature is included.

The biology and morphology of *Pnyxia scabiei* Hopkins (Diptera: Nematocera), S. MADWAR (*Bul. Soc. Roy. Ent. Égypte*, 26 (1933), No. 4, pp. 136-149, pls. 2, figs. 4).—This is an account of the history, biology, and morphology of the potato scab fly, which has not yet been recorded from Egypt. Recently reported studies of this pest at the Ohio Experiment Station have been noted (E. S. R., 69, p. 693).

Chemoreceptors of blowflies, N. E. MCINDOO (*Jour. Morph.*, 56 (1934), No. 3, pp. 445-475, figs. 10).—This is a report of studies of the morphology of all the so-called gustatory and olfactory organs of blowflies, tests having been conducted to determine if these insects taste with the tarsi and smell with the antennae and palpi. It is reported for the first time that the function of the pores in spiders and insects has been proved to be olfactory.

The early embryological development of *Phormia regina*: Diptera (Calliphoridae), M. AUTEN (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 3, pp. 481-506, figs. 43).—This contribution is presented with a 4-page list of references to the literature.

Incubation period of eggs of certain muscoid flies at different constant temperatures, R. MELVIN (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 3, pp. 406-410, fig. 1).—In the studies here reported, the details of which are presented in tabular form, it was found that "high as well as low temperatures prolong the incubation period of eggs of certain muscoid flies. None of the species studied hatched at 109° F. Eggs of four species, namely, *Musca domestica*, *Cochliomyia macellaria*, *Phormia regina*, and *Lucilia cuprina*, hatched at 104°, while those of *L. sericata*, *L. unicolor*, *L. australis*, *Haematobia irritans*, and *Stomoxys calcitrans* failed to hatch at this temperature. The lowest temperature at which eggs of *C. macellaria* will hatch is not far below 59°, since less than 10 percent hatched at this temperature. The reciprocal of time-temperature curves of the eggs of certain muscoid flies are distinctly S-shaped, and their applicability in determining zeros for computing temperature summations seems questionable."

Revision of the American two-winged flies belonging to the genus *Cuphocera*, H. J. REINHARD (*U. S. Natl. Mus. Proc.*, 83 (1934), No. 2974, pp. 45-70).—In this revision of the tachinid genus *Cuphocera* contributed from the Texas Experiment Station, 16 species are recognized, of which 10 are described as new to science.

Spraying experiments for the control of fruit fly in the Stanthorpe district, H. JARVIS (*Queensland Agr. Jour.*, 42 (1934), No. 4, pp. 470-472).—In work conducted in the Stanthorpe district of Queensland with the Queensland fruit fly *Chaetodacus tryoni* Frogg., nicotine sulfate and white oil, used at the rate of 0.5 pt. of the former and 2 qt. of white spraying oil to 40 gal. of water, had definite value in protecting apples from fruit fly attack, the fruit of the sprayed trees being practically 100 percent clean, while the fruit on the control trees was 75.9 percent fly infested. It is pointed out that this is a preliminary experiment, and that further work must be conducted before recommendations can be made.

The Mediterranean fruit fly (*Ceratitis capitata*), L. J. NEWMAN (*Jour. Dept. Agr. West. Aust.*, 2. ser., 11 (1934), No. 3, pp. 427-433, figs. 11).—Reporting on the biology and control of this fruit fly, it is stated that it was more numerous and widespread during the last fruit season than ever before. The increased attack on fruits which are normally only more or less accidentally invaded was a feature of the year.

A new method of marking fruit flies for migration studies, L. B. RIPLEY and G. A. HEPBURN (*Union So. Africa Dept. Agr., Sci. Bul. 120* (1933), pp. 5).—A new method of marking fruit flies that has been used by the author with promising results consists in the feeding of flies upon stained milk to establish a pellet of colored casein in the stomach. Of the four stains thus far tested gentian violet, safranine, and methyl green have all given very satisfactory results, but eosin cannot be used owing to its high toxicity. Gentian violet at 0.2 percent gave slight indications of toxicity; at 0.1 percent it appeared quite nontoxic. With a high percentage of individuals, all three of the promising stains can be readily detected through dissection 2 or 3 weeks after the flies have fed on the stained milk; with a certain minority either the pellet disappeared or the color faded out after 7 to 10 days. Gentian violet and safranine generally remained distinctly visible until the pellet digested.

Fruit flies of the genus *Anastrepha* Schiner 1868 (Diptera: Trypetidae) [trans. title], A. DA COSTA LIMA (*Mem. Inst. Oswaldo Cruz, 28* (1934), No. 4, pp. 487-575, pls. 18, figs. 54).—Sixty-two species of the genus *Anastrepha* are recognized, of which 22 are described as new. A table for the separation of the species, an index to insects and to host plants referred to, and a bibliography of 107 titles are included.

A recent revision of the genus by Greene has been noted (E. S. R., 71, p. 818).

Fly control in Denmark, M. THOMSEN (*League Nations Health Organ. Quart. Bul., 3* (1934), No. 2, pp. 304-324, pls. 13, figs. 2).—This contribution reports upon the commonest species of flies in Denmark, the breeding places of the housefly and stable fly, experiments in connection with oviposition, the influence of temperature on their development, and methods of control. Ten of the plates illustrate the adult and immature stages of the housefly, stable fly, horn fly, and *Haematobia stimulans* in colors.

Fly-free manure heaps, E. and E. SERGENT (*League Nations Health Organ. Quart. Bul., 3* (1934), No. 2, pp. 299-303, figs. 2).—A description is given of two types of manure containers (which preclude the breeding of flies) that have been tested by the Pasteur Institute of Algeria, referred to as the urban type and the rural type.

The best methods of treating manure-heaps to prevent the hatching of flies, J. PARISOT and L. FERNIER (*League Nations Health Organ. Quart. Bul., 3* (1934), No. 1, pp. 1-31, figs. 13).—This contribution reports upon means of controlling flies, particularly the housefly, as applied to conditions in France.

The tropical rat flea in the interior of the United States, R. L. ROUDABUSH and E. R. BECKER (*Science, 80* (1934), No. 2065, p. 97).—Collection of the oriental rat flea in large numbers at Ames, Iowa, indicates that this form has become well established in the interior of the United States.

Reactions of *Ctenocephalides felis* to *Dipylidium caninum*, H. T. CHEN (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 6* (1934), No. 5, pp. 603-637, figs. 31).—Following a brief introduction, which includes a historical review, a résumé of the life histories of fleas and of dog tapeworms, and material and methods, host reactions are considered at some length. The study relates particularly to the reaction of the cat flea to infection with the dog tapeworm *D. caninum*. The literature relating to the subject has been reviewed in connection with a 3-page list of references to the literature.

Studies on the metamorphosis of the Japanese beetle (*Popillia japonica* Newman).—II, **Changes in the pH of the blood**, D. LUDWIG (*Ann. Ent. Soc. Amer., 27* (1934), No. 3, pp. 429-434).—In continuation of the earlier studies (E. S. R., 66, p. 852), it was found that "during the metamorphosis of the Japanese beetle there is a change in the pH of the blood from an average of

7.07 in the third-instar larva to an average of 6.79 in the late prepupa. Pupation is accompanied by a change to a more alkaline condition, the mean pH of the early pupa being 6.94. No significant changes were recorded during the pupal stage. Since the late prepupa is the first stage showing an increase in acidity, and since this stage is characterized by pronounced autolysis, it is suggested that the more acid condition is a result of these autolytic changes."

A list of Scarabaeidae collected at Clemson College, South Carolina (Coleoptera), O. L. CARTWRIGHT (*Ent. News*, 45 (1934), Nos. 9, pp. 237-240; 10, pp. 268, 269).—This is a list comprising 147 species of 48 genera of Scarabaeidae, contributed from the South Carolina Experiment Station.

A cerambycid enemy of walnuts, *Oberea linearis* L. [trans. title], A. PAILLOT (*Min. Agr. [France], Ann. Épiphyties*, 19 (1933), No. 6, pp. 369-379, figs. 7).—The author considers the morphology, biology, natural enemies, and combat of this borer, which came to attention in July 1931 as the source of important injury in walnut groves in the region of Nyons, France.

A survey of the position of *Phytalus smithi* Arrow and its natural enemies in Barbados, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 1 (1932), No. 1, pp. 18-23).—A survey of the brown hardback beetle enemy of sugarcane and its natural enemies as of 1928.

The peach tree buprestid *Capnodis tenebrionis* L. [trans. title], A. BALAKHOWSKY (*Rev. Zool. Agr. et Appl.*, 33 (1934), No. 8, pp. 113-125, pls. 2).—An account of the biology, economic importance, and control of this insect.

The Mexican bean beetle in Vermont, H. L. BAILEY (*Vt. Dept. Agr., Insect Control Div. Circ.* 9 (1933), pp. 4, fig. 1).—A brief practical account of this beetle, which first made its appearance in the State in the vicinity of Brattleboro in the summer of 1931.

A galerucid beetle injurious to cucurbits, *C. KWAI-SHANG* (*Lingnan Sci. Jour.*, 13 (1934), No. 1, pp. 103-107, fig. 1).—A brief account of a species of *Ceratia*, probably *C. orientalis* Hornst, one of the most serious enemies of *Luffa acutangula* and other cucurbits occurring in Kwangtung Province. Twenty-one species of plants are known to be attacked, of which 14 are cultivated and 7 wild.

The life history of the tortoise beetle, *Metriorhina circumdata* Hbst. (Coleoptera, Cassididae), K. C. YEUNG (*Lingnan Sci. Jour.*, 13 (1934), No. 1, pp. 143-162, pls. 2).—The tortoise beetle here considered attacks the foliage of sweetpotato plants in the vicinity of Canton each year, as well as several other species of the genus *Ipomoea*.

Metathely in larvae of the confused flour beetle (*Tribolium confusum* Duval), R. H. NAGEL (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 3, pp. 425-428, figs. 5).—A contribution from the Minnesota Experiment Station.

Effect of bluestain fungi on southern pines attacked by bark beetles, R. M. NELSON (*Phytopath. Ztschr.*, 7 (1934), No. 4, pp. 327-353, figs. 5).—The author concludes that the invariable presence of blue stain fungi (*Ceratos-tomella pini*) in pines successfully attacked by bark beetles and the phenomenon of specificity indicate that beetles are direct carriers of blue stain inoculum. *C. pini* is probably indispensable to the southern pine beetle, since the fungus brings about a reduction of the water content of infested trees to the degree necessary for beetle brood development. Although the girdling effect of beetle tunnels would in time kill infested pines, it is believed that the cause of death is due to the action of blue stain fungi on the tori in the wood tracheids.

"Shot-hole" borers and winter injury, P. J. PARROTT (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, p. 6, fig. 1).—A brief account is given of the

fruit bark and peach bark beetles, the two principal species that make shot holes in the trunks and branches of fruit trees.

Combating the banana root borer: Paring the corms method [trans. title], F. SEIN, JR. (*Puerto Rico Insular Sta. Circ. 103* (1934), *Spanish ed.*, pp. 11, figs. 3).—This practical information on the banana root borer of the banana and plantain, supplementing that given in Circular 82 (E. S. R., 50, p. 661), is largely included in the English contribution noted on page 655. In the propagation of these fruits the author recommends the planting of seed corms or suckers selected from stools with few or no tunnels in the mother corms, growing on the least infested plantations and freed from eggs and small larvae by paring, as the most practical means of control. Infested corms, as indicated by tunnels, should not be used, and those selected should be set in soil which has not grown bananas or plantain for at least a year and at some distance from old plantings.

Infestation of stored cocoa by weevil (*Araecerus fasciculatus*) and moth (*Ephestia cautella*), G. S. COTTERELL (*Gold Coast Dept. Agr. Bul. 28* (1934), pp. [1]+14, pls. 2).—The damage caused to cacao beans by the coffee bean weevil and *E. cautella* is differentiated. Notes are given on their biology and means of control.

Toxicity tests with beetles of *Calandra* sp. and *Dinoderus* sp., S. KAMESAM ([*Indian*] *Forest Bul. 81* (1933), pp. 15-24).—A report upon toxicity tests made with these beetles, the details being given in tabular form.

Two weevil pests of mango leaves, J. C. HUTSON and E. DE ALWIS (*Trop. Agr. [Ceylon]*, 83 (1934), No. 2, pp. 128-135, pls. 2).—The mango leaf-cutting weevil, *Deporaus marginatus* Pasc., and the mango flea weevil, *Rhynchænus mangiferae* Mshl., are dealt with, the nature of their work and their life stages being illustrated by colored plates.

New Zealand beetles and their larvae: An elementary introduction to the study of our native Coleoptera, G. V. HUDSON (*Wellington, New Zeal.: Ferguson & Osborn, 1934*, pp. [7]+236, pls. 17; rev. in *Ent. Mo. Mag.*, 3. ser., 20 (1934), No. 237, pp. 211, 212).—Part 1 of this work deals with beetles in general (pp. 1-12), part 2 with beetle collecting in New Zealand (pp. 13-26), and part 3 with brief descriptive notices of many of the most conspicuous species (pp. 27-170). Part 4 consists of a systematic index of New Zealand beetles (pp. 171-228). The work is accompanied by colored plates prepared by the author, giving typical adult forms of various families and in some cases their immature stages.

[**Contributions on apiculture**] (*Ill. State Beekeepers' Assoc. Ann. Rpt.*, 32 (1932), pp. 51-116, 124-152, 185-193, figs. 32).—Contributions relating to apiculture here presented include the following: Bees and Their Care, by J. A. Munro (pp. 51-64); Red-Clover Pollination by Honeybees in Colorado, by R. G. Richmond (pp. 65-81); Pollination of Deciduous Fruits by Bees, by G. L. Philp and G. H. Vansell (pp. 82-103); The Influence of Bees upon Clover and Alfalfa Seed Production, by C. R. Megee and R. H. Kelty (pp. 104-110) (E. S. R., 67, p. 384); Temperature Gradient in the Egg-Laying Activities of the Queen Bee, by W. E. Dunham (pp. 111-116) (E. S. R., 64, p. 755); Relation of Commercial Honey to the Spread of American Foulbrood, by A. P. Sturtevant (pp. 124-152); State Law on Bee Diseases (pp. 185-189); American Foulbrood (pp. 190, 191); and European Foulbrood (pp. 192, 193).

"White tupelo" of western Florida, E. OERTEL (*Amer. Bee Jour.*, 74 (1934), No. 7, pp. 310-312, figs. 3).—It has been found from the collection and identification of specimens of tupelo that *Nyssa ogeche* is the source of the

valuable tupelo honey of western Florida. *N. aquatica*, *N. biflora*, and *N. sylvatica* appear to be major honey plants in some localities in the South.

The green tomato bug egg parasite (*Microphanurus megacephalus*), L. J. NEWMAN (*Jour. Dept. Agr. West. Aust.*, 2. ser., 11 (1934), No. 3, p. 434, fig. 1).—The successful introduction in 1933 of *M. megacephalus* from Egypt into Western Australia is noted, definite evidence having been obtained that the parasite had reproduced in the field.

Parasites impede peach moth progress, D. DANIEL (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, p. 3).—Parasites of the oriental fruit moth are said to have greatly reduced the population of this pest. *Macrocentrus ancylivorus*, the most important parasite in western New York, appears to be unable to exert appreciable control of the oriental fruit moth in quinces, where arsenical sprays have been effective, arsenate of lead (2.5 lb.) plus summer oil (1 gal.) applied at 2-week intervals having given the best results. Arsenate of lead alone and summer oil (1 gal.) plus nicotine sulfate (1 pt.), however, were almost as effective. It is said that when properly applied these sprays should give approximately 90 percent clean fruit in quince plantings.

The biology of *Tetracnemus pretiosus* Timberlake, D. W. CLANCY (*Calif. Univ. Pubs. Ent.*, 6 (1934), No. 8, pp. 231-248, figs. 5).—This contribution relates to an internal parasite of the citrophilus mealybug, which was discovered in Australia by H. Compere in 1927 (*E. S. R.*, 67, p. 432) and has since become well established in the citrus areas of southern California.

"In common with other unusually active parasites, *Tetracnemus* is short lived. At a temperature of from 75° to 80° F. the males average 8.7 days and the females 9.2 days. The sex ratio is approximately even. In an examination of 1,024 adults 42.18 percent were found to be females and 57.81 percent males. *Tetracnemus* is arrhenotokous, an unfertilized female always producing males. There is no preoviposition period and oviposition is rapid, there being normally from 100 to 200 eggs laid. The eggs are inserted in the hemocoel of the host. Newly hatched to half-grown citrophilus mealybugs are preferred, although *Tetracnemus* will also oviposit in *Pseudococcus citri* [the citrus mealybug] and *P. maritimus* [the grape mealybug], where the eggs are destroyed apparently by phagocytic action. The eggs are laid singly and measure only 0.03 mm in length. Superparasitism, however, occurs under crowded conditions, but only one adult emerges from a single host.

"Three larval stages and a prepupal stage were distinguished. Nearly one-half the first larval instar is spent within the chorion, which greatly enlarges to accommodate the developing larva. The larvae undergo radical morphological change, evolving from unusual forms, covered with blunt body projections of varying lengths, to relatively unornamented forms in the final instar, which are similar to the greater number of mature chalcidoid larvae. The host becomes restless as the parasitic larva nears maturity, and death occurs as soon as the latter becomes fully fed, the host body forming a dried 'mummy' which envelops the parasite pupa. *Tetracnemus* completes several more annual generations than does its host."

The developmental stages of *Bracon tachardiae* Cam. (Hym.), P. M. GLOVER (*Bul. Ent. Res.*, 25 (1934), No. 4, pp. 521-539, figs. 7).—This is a report of studies of the anatomy of the developmental stages of *B. tachardiae*, an ectoparasite of the larva of *Eublemma amabilis* Moore, a noctuid predator of major importance on lac (*Laccifer lacca* Kerr) in India.

Observations on the biology of *Microbracon pygmaeus* (Prov.), an important parasite of *Coleophora pruniella* Cl., M. H. DONER (*Ann. Ent. Soc.*

Amer., 27 (1934), No. 3, pp. 435-442).—This is a contribution from the Wisconsin Experiment Station dealing with an ectoparasite of the mature larva of the cherry casebearer, which, though first observed in Door County in 1930, has been known to entomologists since 1880. The host has come to be a major insect pest of apple and cherry in the Door County Peninsula, Wis., as well as in Michigan and certain sections of Canada.

Of 4 ichneumonoid and 28 chalcidoid parasites reared from this casebearer during the study, *M. pygmaeus* was the most important factor in limiting its numbers in Door County.

This parasite has been recorded from seven other States as far distant as Massachusetts, Maryland, and Florida and from seven species of the genus *Coleophora*.

Material collected from numerous orchards at various times during the spring feeding period of the host showed a parasitism ranging from 1 percent in heavily infested up to 92 percent in moderately and lightly infested orchards. It is considered to exert a remarkable degree of control in certain infested orchards.

The status of *Trichogramma* as a control of *D. saccharalis* in Barbados, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 1 (1932), No. 1, pp. 29-36).—The information presented supplements that previously noted (*E. S. R.*, 64, p. 361; 69, p. 548).

Rate of egg deposition of *Diatraea saccharalis* and extent of larval mortality in canefields and their relation to control of *Diatraea* by *Trichogramma minutum*, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 2 (1933), No. 4, pp. 33-52).—In further work (*E. S. R.*, 70, p. 506) it has been demonstrated by large scale and carefully supervised experiments that at present in Barbados egg deposition by the sugarcane borer reaches a maximum of from 27,000 to 28,000 per acre and a minimum of around 2,500 per acre, which is including a 15 percent correction for field errors, and that contrary to the usual experience and expectation prior to effective *Trichogramma* colonizations this egg deposition diminishes from March onward.

During several months of the year, considerable sugarcane borer egg mortality is caused by the erythraeid mite *Atomus* sp. which punctures and sucks the eggs, and by a psocid larva which eats out the egg contents, both working independently of and irrespective of parasitism by *Trichogramma*. In the early part of the year egg mortality from these causes exceeds mortality due to natural parasitism by *Trichogramma*. Later on, normal egg parasitism equals or surpasses and in colonized fields greatly exceeds this mortality. The combined effect, however, is very greatly to lessen the number of young sugarcane borer larvae.

"It is shown that early larval mortality does occasionally reach the figure of over 90 percent, but only during the early months of the year, when cane growth is sparse. When the cane stools are well developed, and cane fields present a uniform slightly interlocking growth of 3 to 5 ft. in height, larval mortality is less, and the survival rate and penetration of cane is much higher, even up to 100 percent larval survival, and a corresponding 0 percent larval mortality. . . .

"The error of overestimating the numbers of *Diatraea* eggs per acre and of larvae which eventually hatch therefrom, and in presuming a continuous high larval mortality, and in considering that that presumed mortality renders largely ineffective the critically timed increase in egg destruction by the mass reared parasite *Trichogramma*, and in presuming extraordinarily large numbers of natural *Trichogramma* per acre is responsible for much misleading

criticism of the effectiveness of *Trichogramma*. This parasite, correctly used, has been proved to be effective against *Diatraea* in cane in Barbados, Louisiana, and Peru."

A contribution towards the solution of the problem of control of *Diatraea saccharalis* in cane through a mathematical evaluation of the real mortality of *D. saccharalis* due to egg parasites, egg predators, natural larval mortality, larval parasitism, and other factors, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 3 (1934), No. 1, pp. 59-80).—In continuation of the studies above noted the author reports upon a mathematical analysis of conditions as they now are in Barbados, a comparison with the analysis of conditions as they would be without mass colonization of *Trichogramma minutum*, and an analysis of conditions as they might be were a mortality factor such as a well-established mature larval parasitism introduced, or were an existing factor such as early larval mortality greatly increased in value. "A résumé is given of colonization methods and conditions of cane growth and of cane planting in Barbados which should make clear the general conditions under which economic control over *D. saccharalis* has been obtained, and also make clear the relation between numbers of parasites colonized per acre in 1933 and the number of *Trichogramma* present naturally per acre month by month."

Some temperature and humidity relations of two races of *Trichogramma minutum* Riley (Hym. Chalcididae), H. O. LUND (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 2, pp. 324-340, figs. 2).—This is a report of a study of the length of the life cycle, the sex ratio, and the mortality of two races of the chalcid parasite, *Trichogramma minutum*, reared in the eggs of the Angoumois grain moth at four different conditions of humidity (30, 50, 70, and 100 percent) at each of four temperatures (32°, 27°, 22°, and 17° C.).

It is concluded that "the median temperature range for which the thermal constant seems to hold for *Trichogramma* is only from approximately 20°-30°. The theoretical threshold of development is about 15°. The rate of development of *Trichogramma* within the eggs of the host bears an inverse relation to the relative humidity. There is apparently no significant difference between the rates of development of males and females at 27° and 70 percent R. H. The fastest development occurred at 100 percent R. H. and 32°. The sex ratio of *Trichogramma* is affected by neither humidity nor temperature—not even by very low temperatures (12°) as has been suggested by other workers.

"The mortality of both the parasite and the host increases with a decrease in relative humidity, the mortality of the parasite much more markedly than that of the host. The mortality of the parasite increases at both extremes of temperature, 32° and 17°. The factors producing the death of the parasites are not necessarily identical with those producing the death of the host eggs, since the mortality of the parasitized eggs is much more variable with temperature and humidity than is the mortality of the unparasitized eggs. This differential effect of physical factors upon host and parasite is of interest as a laboratory demonstration of a phenomenon which is undoubtedly very important in nature.

"The Louisiana gray race develops more slowly than the California yellow race at low temperatures and more rapidly at high temperatures. The average sex ratio of the gray race (0.654) is somewhat higher than that of the yellow race (0.578). The mortality of the gray race is greater than that of the yellow race at the lower humidities and slightly less than that of the yellow race at the higher humidities. The optimum condition of temperature and relative humidity (considering only rate of development, percentage of survival,

and sex ratio) is 100 percent R. H. and 32° for both races. The biotic potential (as represented by the very incomplete calculations of 'optimum products') of the gray race is more strikingly affected by a lowering of the relative humidity and the temperature than is that of the yellow race."

On the great abundance of the black widow spider, *A. MILZER* (*Science*, 80 (1934), No. 2079, p. 403).—An increased abundance of *Latrodectus mactans* Fab. in Colorado and neighboring States in the summer of 1934 is recorded. Contributing from Colorado, the author reports having found the two-striped grasshopper to be its most frequent prey.

A contribution to the taxonomy and morphology of the tick genus *Boophilus* Curtice [trans. title], W. MINNING (*Ztschr. Parasitenk.*, 7 (1934), No. 1, pp. 1-43, figs. 34).—The author divides the genus *Boophilus* into three subgenera—*Boophilus*, *Palpoboophilus* n. sg., and *Uroboophilus* n. subg. and describes many new species and several new subspecies.

The prevalence of ticks (*Ixodes holocyclus*) at Koala Park, Pennant Hills, N. S. W., B. McMICHEN (*Aust. Vet. Jour.*, 10 (1934), No. 5, pp. 180, 181).—The author records the death of several Tasmanian wallabies (*Macropus ruficollis* Bennetti) apparently due to infestation by the tick *I. holocyclus* in New South Wales.

The red-legged earth mite *Halotydeus destructor* (Tucker) in South Australia, with remarks upon *Penthaleus major* (Dugès), D. C. SWAN (*Jour. Dept. Agr. So. Aust.*, 38 (1934), No. 3, pp. 353-367, figs. 6).—An account is given of *H. destructor*, known as a pest of market crops in South Africa since 1908 and in Western Australia since 1917, and of *P. major*, commonly found in the same situations as *H. destructor*, its habits being very similar. A list is given of 30 references to the literature.

Notes on the acarids (Tyroglyphidae) observed in stored tobacco districts [trans. title], M. ANDRÉ (*Min. Agr. [France], Ann. Épiphyties*, 19 (1933), No. 6, pp. 331-356, figs. 11).—A brief introduction (pp. 331, 332) to this contribution, incorporating an unpublished article prepared by M. Hardy in 1867 (pp. 333-346) which reports at some length on observations of the acarids, including both saprophytic and predatory forms, occurring in tobacco store-houses at Strasbourg, is followed by a critical review of Hardy's contribution and the results of the author's studies.

Studies on a mermithid worm parasitic in *Margaronia pyloalis* Walker [trans. title], T. YAMAUCHI (*Bul. Imp. Seric. Expt. Sta., Japan*, 8 (1934), No. 8, pp. 383-424, pl. 1, figs. 2; *Eng. abs.*, pp. 423, 424).—This contribution relates to a study made of the mermithid worm parasitic in *M. pyloalis*, a serious insect enemy of the mulberry leaf, which appears to be *Hexamermis microamphidis* Steiner.

ANIMAL PRODUCTION

Methods of experimentation in animal nutrition, G. DUNLOP (*Jour. Agr. Sci. [England]*, 23 (1933), No. 4, pp. 580-614, figs. 6).—In this paper from the Animal Nutrition Institute, Cambridge University, the author shows that the unsatisfactory nature of the methods adopted in their feeding experiments has been due to neglect in controlling variable factors, other than those being investigated, which affect the growth rate. Age, sex, condition, and previous growth rate have been proved to have no effect on the rate of live weight increase of swine. The basis on which animals are allotted to groups to insure uniformity is without foundation. The merits and disadvantages of different methods of feeding experiments are discussed.

A method including individual rationing, random distribution of animals for statistical analysis of results, and elimination of variables due to controlled factors that must remain uncontrolled in other methods is described. The precision, accuracy, and sensitivity of this method were shown to be 16 times greater than for the group-feeding method. A standard technic for feeding experiments is described that is suitable for adaptation at other research institutions for animal nutrition.

[Investigations with livestock] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1934, pp. 88, 89, 94, 95, 96*).—Information is given on the progress of improving beef cattle, sheep, and poultry by breeding and selection, record-of-performance studies with beef cattle and swine, and investigations on the quality and palatability of lamb and pork.

[Livestock investigations in California] (*California Sta. [Bien.] Rpt. 1933-34, pp. 79-82, 85, 86, 113, 114, pl. 1*).—Data obtained in studies with beef cattle are reported on nutritional qualities of range plants, the importance of vitamin A for range cattle, and the value of supplemental feeds for steers.

Information was obtained in studies on the vitamin A deficiency of barley for swine, crossbreeding sheep for producing lambs of the best quality, comparisons of ram and ewe fleeces, and comparisons of branding fluids for sheep.

Poultry studies yielded results on feeding experiments with vitamin G and iodine supplements, factors influencing quality of eggs, breeding to reduce mortality, and inbreeding turkeys to improve egg production and rate of growth.

[Experiments with livestock in West Virginia] (*West Virginia Sta. Bul. 263 (1934), pp. 27-31, 32, 33, figs. 2*).—Results obtained in studies with beef cattle are reported on creep-feeding v. dry-lot feeding, finishing steers on grass, effect of grass on the color of beef produced, and corn silage studies.

Sheep studies yielded information on trends in fine-wool sheep production, and the value of Corriedale rams for crossing on native ewes.

With poultry, data are reported on the value of progeny testing of males, the effect of age on egg yields and egg weight, interval as an index of annual production, methods of feeding grain to pullets, and poultry management.

[Livestock experiments in Wyoming] (*Wyoming Sta. Rpt. 1934, pp. 11-16, 27, 28, 33, 34, 36, 37, 39, 41, 42, 43-45*).—Results obtained in studies with beef cattle are reported on minerals for beef cattle, and efficient combinations of home-grown feeds for steers at the Worland Substation.

Sheep studies yielded information on anemia in lambs, crossbreeding for lambs, Australian Merinos in Wyoming, the feeding value of roughages for wintering lambs at the Eden Substation, beet byproducts for fattening lambs at the Torrington Substation, and beet tops and bean straw for lambs at the Worland Substation.

A study at the Gillette Substation produced results on a comparison of grains for fattening pigs.

Information is reported from poultry studies on the crooked breast bones of turkeys, and lighting a poultry house with a gasoline lantern at the Lyman Substation.

The comparative nutritive value of different fish meals for chicks, P. R. RECORD, R. M. BETHKE, O. H. M. WILDER, and D. C. KENNARD (*Poultry Sci., 13 (1934) No. 5, pp. 259-266*).—Investigations were undertaken at the Ohio Experiment Station to obtain information on the comparative feeding value of different fish meals and byproducts commonly available on the market. A total of 10 different meals was fed to White Leghorn chicks from the same parent stock. The birds were placed on their respective rations a few hours after removal from the incubator.

It was found that these fish meals varied greatly in their nutritive value when fed as the only protein supplement on a 12 percent protein basis. Adding 5 percent of dried skim milk to fish meal and meat scrap rations resulted in improved growth, except in the case of cod and haddock and crab meal. The milk product tended to equalize the growth-promoting value of the fish meals. Substituting one-third or one-half of the meat scrap protein in a ration containing 5 percent of dried skim milk with fish meal protein resulted in significantly greater growth, while replacing more than one-third of the meat scrap protein in a ration where no milk was fed with fish meal did not increase growth.

Rations containing fish meals, with the exception of unsupplemented flame-dried menhaden meal, were utilized more efficiently than those containing meat scrap alone or meat scrap and 5 percent of dried skim milk. Crab and shrimp meal rations were not utilized as efficiently as other fish meal rations. The fish meals varied greatly in their vitamin G complex content. It was shown that the drying temperature affected the nutritive value of menhaden fish meal.

Effect of method of manufacture on the nutritive value of fishmeals as determined by growth studies with chicks, P. R. RECORD, R. M. BETHKE, and O. H. M. WILDER (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 8, pp. 715-722).—Continuing the above study, tests were undertaken to obtain more definite information on the effect of the methods of processing and the drying temperatures on the nutritive values of the meals. The fish meals used were prepared under experimentally controlled conditions in the laboratories of the U. S. Bureau of Fisheries.

Cooking and centrifuging of fish wastes prior to drying removed some of the vitamin G complex, and high drying temperatures also had a deleterious effect on these factors. The proteins of vacuum-dried haddock meals were superior to those of flame-dried haddock meal, but there was no significant difference in the growth response of chicks fed steam-dried or vacuum-dried haddock meals. No significant difference in protein value was observed between meals made by the wet-rendering and the dry-rendering processes. Meal made from the waste of the edible portion of the haddock fillet industry was superior in protein value to a meal made from the heads and tails, or the entire waste. Meal made from the heads and tails had more of the vitamin G factors than meal made from the waste of the edible portion.

Fish meal proteins were significantly better than meat scrap proteins for promoting growth in chicks. The proteins of cod meal and haddock meal were equally efficient for growth.

Effect of method of manufacture on the nutritive value of fishmeals as determined by nitrogen-balance studies with rats, O. H. M. WILDER, R. M. BETHKE, and P. R. RECORD (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 8, pp. 723-730).—Nitrogen-balance studies with rats were undertaken in continuance of the above study to obtain more specific information regarding the differences in protein efficiency.

It was found that high drying temperatures, as used in flame drying, significantly lowered the digestibility and biological value of the protein in haddock meal. The utilization of the absorbed nitrogen from steam-dried and vacuum-dried meals prepared either by the wet- or dry-rendering processes was the same. However, the proteins of the vacuum-dried meal appeared to be slightly more digestible than those of the steam-dried haddock meals. That the method of processing fish waste prior to drying significantly affected the biological value of the protein was shown by the fact that the absorbed nitrogen from

the wet-rendering process was more efficiently utilized than that from the dry-rendering process. This higher biological value of the wet-rendered whole-waste haddock meals was probably due to the lower percentage of water-soluble nitrogen constituents that are of exceptionally low biological value. From 20 to 25 percent of the total nitrogen in dry-rendered meals was soluble in hot water, while only from 10 to 15 percent of the total nitrogen of wet-rendered meals was soluble.

The protein of haddock meal prepared from the waste of the edible portion was significantly more digestible than that of meals made from the whole waste or the heads and tails. The same was true in regard to the utilization of the absorbed nitrogen. The difference in biological value between meals from the whole waste and from the waste of the edible portion was not biometrically significant. The protein of wet-rendered steam-dried haddock meal was more digestible and had a significantly higher biological value than that of meal similarly prepared from the whole waste of the cod.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 385 (1934), pp. 48).—This is the usual report on 1,901 samples of feeding stuffs officially analyzed for protein, fat, and fiber contents as of April 1934 (E. S. R., 72, p. 89).

An improved stall for the study of nitrogen metabolism of bullocks, P. E. LANDER and L. C. DHARMANI (*Agr. and Livestock in India*, 4 (1934), No. 4, pp. 412, 413, pl. 1, figs. 2).—In this paper from the Agricultural College and Research Institute, Lyallpur, India, the authors describe a stall used in nutrition experiments with cattle.

A study of some problems in cattle finishing, J. P. SACKVILLE and R. D. SINCLAIR (*Alberta Univ., Col. Agr. Bul.* 25 (1934), pp. 33, figs. 9).—The results of three tests are given in this bulletin.

Comparison of steer and heifer calves.—The results of a series of three tests showed that steer calves consumed about 0.7 lb. more grain per head per day than did heifer calves. The average daily gains for steer calves were 1.7 lb. and for heifer calves 1.6 lb. per head. While the heifer calves gained less total weight, they showed more finish at the end of the feeding period than did steer calves. Heifer calves required somewhat more feed per 100 lb. of gain than did steers, but the latter sold for an average of 10 ct. more per hundredweight. Because of the cheaper gains and higher selling price the steer calves returned more profit than heifer calves. The average dressing percentage was 56.9 for heifers and 54.7 for steers. The carcasses of heifers graded somewhat higher than those of steers, although some of the heifer carcasses showed signs of wastiness.

Skim-milk fed calves in the feed lot.—In a series of three trials the consumption of grain was slightly lower and of roughage slightly higher for farm-raised skim milk calves as compared with range-bred calves, and the respective average daily gains were 1.8 and 1.7 lb. per head. The skim milk calves cost less and made more economical gains, but returned less profit over feed cost than the range calves due to the fact that the latter sold for 82 ct. more per hundredweight. Range calf carcasses graded higher than those of the skim milk calves, which lacked finish and did not show the necessary development in the region of the high-priced cuts. However, the results did indicate that pail-fed calves can be converted into acceptable baby beef with from 6 to 7 mo. of heavy grain feeding.

"Degree of finish" as related to economy of production and market value.—In this investigation two groups of yearlings were fed in each of four trials. The ratio of grain to hay consumed was 1:1 in the full-grain-fed lot and 1:3

in the half-grain-fed lot. The average daily gains were 2.1 lb. and 1.8 lb. per head in the respective lots. The cost per 100 lb. of gain was 46 ct. higher in the full-grain lot, but these animals sold for 50 ct. per hundredweight more and returned a greater profit over feed costs than the limited-grain-fed steers. Full-feeding grain increased the cash value of oats 55 percent and of barley 69 percent, and created a market for oat hay at prices ranging from \$5 to \$8 per ton. These cattle gave a consistently higher carcass yield than the limited-fed steers. It is concluded that the full-feeding of grain is a better practice than limiting the grain ration.

Mineral supplements for fattening steers, G. E. MORTON, H. B. OSLAND, and R. C. TOM (*Colorado Sta. Press Bul.* 82 (1934), pp. 11, fig. 1).—In this test eight lots of 10 yearling steers each were fed for 163 days on a basal ration of corn, barley, wet beet pulp, and salt. In addition lots 1, 2, 3, and 6 received 1 lb. of cottonseed cake, lots 4 and 7 1.5 lb. of cottonseed cake, and lots 5 and 8 2 lb. of cottonseed cake per head daily. Alfalfa hay was fed in lots 1 and 2, oat straw in lots 3, 4, and 5, and cut sorgo cane fodder in lots 6, 7, and 8. All lots except lot 1 received 0.1 lb. of refuse lime per head daily. The average daily gains in the respective lots, based on market weight, were 2, 1.8, 1.8, 1.9, 1.9, 2, 2, and 2 lb. per head.

The results showed no beneficial effect from adding high calcium carbonate limestone to a ration composed of grain, cake, wet beet pulp, and alfalfa hay. While substituting oat straw supplemented with limestone for alfalfa hay reduced the rate of gain, it also reduced the cost of gain. Feeding 1 lb. of cottonseed cake with oat straw or cane fodder was more economical than large amounts. Cane fodder supplemented with limestone had a greater feed-replacement value than alfalfa hay in a beet byproduct ration.

In a supplementary test two lots of 13 calves each were fed a basal ration of ground barley and cottonseed cake for 133 days. In addition lot 1 received whole cane fodder and lot 2 cut cane fodder. The average daily gains in the respective lots were 1.1 and 1.2 lb. per head. It was concluded that when medium-to-fine stalk cane was available grinding did not pay.

The influence of feed on the meat color of cattle [trans. title], V. STEENBERG (*Beret. Forsøgslab. K. Vet. og Landbohøjskoles* [Denmark], 159 (1934), pp. 84, pls. 6, figs. 3; *Eng. abs.*, pp. 73-75).—This investigation at the Royal Veterinary and Agricultural College, Denmark, was carried out with 32 dairy cows, 12 young bulls, 25 young steers, and 19 whole-milk calves of the Red Danish, Black and White Jutland, and Shorthorn breeds.

The whole-milk-fed calves made the largest daily gains, followed in descending order by the young bulls, young steers, and cows. Fattening cull cows was expensive because the gain in live weight was due to fat deposition alone. Shrinkage was found to vary greatly, depending on length and distance shipped, previous feeding, and environment of the animals. In this test the cows shrank 3 percent, calves and bulls 2 percent, and young steers 4 percent. The dressing percentage was approximately 54 for cows and heifers, 56 for steers and bulls, and 60 for whole-milk calves. Bull carcasses yielded proportionately more of the cheaper cuts of beef than did young cows.

In this work the feed used did not exert much influence on the color of meat of animals of the same age and sex. A ration of natural feeds rich in iron seemed to give a darker meat than did an iron-poor ration. Green grass, clover, and alfalfa tended to produce darker meat than mangels. As the age of the animal increased the meat produced was darker. Feed had some influence on the color of the outer and inner layers of tallow, but here again the tallow tended to become more yellow with advancing age. Swedes produced

slightly darker and grass, clover, and alfalfa much darker tallow than did mangels and potatoes. The Shorthorns had lighter colored meat than animals of the other breeds.

A scale of colors based on observations of the lean and tallow is given.

Some sheep feeding experiments, W. G. R. PATERSON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 46 (1934), pp. 146-169, figs. 2).—The results of feeding trials at the West of Scotland Agricultural College indicated that a limited allowance of swedes supplemented with a fairly liberal allowance of concentrates was distinctly superior for producing gains than a more liberal ration of swedes and a relatively smaller concentrate ration in the winter feeding of sheep for mutton production.

In spite of the wide differences in the protein content of palm kernel, cottonseed, and peanut meals, there was little difference in the results obtained from these feeds even when they made up 37.5 percent of the ration. The peanut meal was slightly better than the other meals, and its superiority was greater in the indoor than in the outdoor feeding.

Dried beet pulp was an efficient substitute for swedes, and 1 lb. of pulp could effectively replace from 7 to 8 lb. of swedes. The beet pulp may be fed dry if sheep have access to water, and as much as 2 lb. per day was fed without any bad effects. Silage was less suitable than swedes or beet pulp in the fattening ration and could replace half of the swedes with satisfactory results, but the dressing percentage of wethers fed silage was lower than that of those fed swedes or beet pulp. A total of 2.4 lb. of dry matter seemed to satisfy the appetite of 80-lb. wethers.

Lamb feeding report (*Sheep and Goat Raisers' Mag.*, 15 (1934), No. 2, pp. 16-18).—In cooperative tests between the Texas Experiment Station and the Texas Technological College, six lots of 20 lambs each averaging 59.5 lb. per head were fed for 93 days. All lots received cottonseed meal and salt. Lots 1, 2, and 3 were fed milo head chops during the entire period, while lot 4 received this feed for the last 63 days and lot 5 for the last 33 days. Lot 1 was fed ground alfalfa hay, lot 2 sumac sorghum silage, lot 3 sumac silage plus 0.4 oz. of pulverized oyster shell per head daily, and lots 4, 5, and 6 cottonseed hulls. The average daily gains in the respective lots were 0.5, 0.3, 0.4, 0.3, 0.3, and 0.3 lb. per head.

Lot 1 gained 4.5 lb. more per head than lot 3 and 10.7 lb. more than lot 2. This difference emphasizes the importance of feeding approximately 0.4 oz. of a high calcium carbonate supplement per head daily when nonleguminous roughages are used. The addition of the grain supplement during the last 63 and 33 days of the test did not increase the gains or finish of the lambs materially. The cottonseed meal and hulls ration produced the poorest gains, but was somewhat more economical than the ration fed in lot 4. The carcasses of the lambs in the last three lots graded lower than those in the other lots.

Mineral supplement for lamb fattening rations, G. E. MORTON, F. H. LEINBACH, and R. C. TOM (*Colorado Sta. Press Bul.* 83 (1934), pp. 11).—In this test 19 lots of 20 lambs each were fed for 131 days on a basal ration of ground corn and salt. Alfalfa hay was fed in lots 1, 2, 4, 16, 17, 18, and 19, while cut sorgo cane fodder was fed in the remaining lots, except lot 13 which received whole cane fodder. Lots 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, and 15 received cottonseed cake. Bone meal was fed in lots 2 and 6, Dicapho in lots 4 and 5, Calcarbo in lots 3 and 16, Shell Marl Meal in lots 8 and 17, refuse lime in lot 18, and Anaconda in lots 10 and 19. Lots 11, 12, 14, and 15 received a mixture of Anaconda and refuse lime in such proportions that the respective lots received a Ca-P ratio of 2:1, 3:1, 4:1, and 5:1. The average daily gain in all

lots was 0.2 lb. per head, except in lot 9 where the lambs gained at the rate of 0.1 lb. per head daily.

The results showed that in a grain-roughage ration cut cane fodder was 62.9 percent as valuable as alfalfa hay. Supplementing the grain-cane fodder ration with cottonseed cake increased gains 45.3 percent and decreased the cost of gains 12.9 percent. While grinding medium-to-fine stalked cane fodder increased its utilization, the increased efficiency was not enough to offset the increased cost. There was no advantage in adding minerals to a ration of corn and alfalfa hay, and little response when added to a ration of corn, cottonseed cake, and cane fodder. Feeding mineral mixtures with a Ca-P ratio of 2:1, 3:1, or 4:1 with a ration of corn, cottonseed cake, and cut cane fodder increased gains slightly, but a 5:1 mixture had a depressing effect on gains and increased costs.

Monthly wool growth in "Hissar Dale" and pure Bikaneri ewes, L. W. SMITH and S. M. HUSSAIN (*Agr. and Livestock in India*, 4 (1934), No. 4, pp. 379-393, pl. 1, figs. 2).—A test at the Government Cattle Farm, Hissar, India, showed that the monthly growth of the fleece of Bikaneri ewes was practically the same for the first and last half of the year. With each period growth was affected by the lambing season and the abundance or lack of feed. During May, June, November, and December, when there was an abundance of green feed following the harvesting of crops, the effect on the rate of growth was appreciable. Similar observations were noted on the wool growth of Hissar Dale ewes.

Three years' control test of feed requirements for breeding sows [trans. title], K. BREIREM (*Meld. Norges Landbr. Høiskole*, 14 (1934), No. 1, pp. 1-87, figs. 5; *Eng. abs.*, pp. 72, 73).—The data for this investigation were obtained over a 3-yr. period from 18 gestation periods (from weaning to parturition) and 19 suckling periods.

During the gestation period it was found possible to use from 39 to 44 percent of coarse fodders, roots, young grass, forage crops, and chopped hay in the ration of sows, about 60 percent of the ration being made up of concentrate feeds and dairy byproducts. During the suckling period the ration had to be made up of 95 percent of concentrate feeds and dairy byproducts and only 5 percent of coarse fodder. It was calculated that sows lost on the average 7.5 kg of weight from parturition to weaning. During an 8-week suckling period pigs required 3 feed units for each kilogram of weight increase.

As a result of these investigations it was calculated that an animal weighing 150 kg required 1.2 feed units per day for maintenance, 1.5 feed units at 200 kg, and 1.7 feed units at 250 kg. During the gestation period a sow in ordinary condition at weaning time required in addition 0.5 feed unit, while a very thin sow required 1 additional feed unit. During this period the animals needed from 100 to 120 g of digestible protein per feed unit. During the suckling period a production feed of 0.5 to 0.6 feed unit per pig per day was required above maintenance, and from 120 to 130 g of digestible protein per feed unit were necessary.

Studies at experiment stations for control of swine breeding stocks during the year 1933 (trans. title), S. BENGTSSON (*K. Landtbr. Akad. Handl. och Tidskr.*, 73 (1934), No. 5, pp. 539-611, figs. 5; *Eng. abs.*, pp. 610, 611).—Results obtained at the Åstorp, Hallsberg, Furulund, and Wiad experiment stations indicated that in the majority of qualities the Swedish Farm breed and the Yorkshire breed are much the same. The Farm breed showed a somewhat lower feed consumption per unit of growth and an increased growth,

but had a larger slaughter loss, a shorter length of body, and a greater thickness of back fat than the Yorkshire breed.

Results obtained at Åstorp during 1923-26 compared with the results of 1933 showed that both breeds yielded better results in some respects during the first period. This was especially true in regard to length of body, which increased particularly among animals of the Yorkshire breed, and with regard to back fat, which was considerably reduced in both breeds. Sows have had a lower growth rate but an increased length of body, a thinner back fat, and better bellies and hams than the boars. In certain strains improved results were obtained in a much higher degree than were obtained for the breeds as a whole.

Supplements to corn for fattening hogs on alfalfa pasture (*Swine World*, 21 (1934), No. 11, p. 10).—In tests at the Indiana Experiment Station six lots of 25 pigs each, averaging 75 lb. initial weight, were self-fed on pasture for 80 days on a basal ration of shelled corn and a mineral mixture. In addition the respective lots received the following supplements, 60 percent of tankage, whole raw soybeans, whole roasted soybeans, whole roasted soybeans limited to 0.5 lb. per head daily, and soybean oil meal, while lot 6 received the check ration only. The average daily gains in the respective lots were 1.8, 1.6, 1.8, 1.8, 1.7, and 1.5 lb. per head.

Tankage and roasted soybeans were practically equal in producing rapid gains as protein supplements to the basal ration. Raw soybeans produced slightly cheaper gains than roasted beans. Soybean oil meal was almost equal to tankage and roasted soybeans. Because of their palatability and because limited amounts were more efficient than unlimited amounts, it was concluded that roasted soybeans could not be self-fed free choice. The control lot made the cheapest gains, but the slower rate of gain and lack of uniformity in finish gave the lot a distinct marketing disadvantage. The high feeding value of pasture was shown by the low requirements for concentrates in all lots.

Potatoes and the pig, T. S. WRIGHT (*Jour. Min. Agr. [Gt. Brit.]*, 40 (1933), No. 7, pp. 605-611).—Tests at the Harper Adams Agricultural College, England, indicated that for satisfactory results cooked potatoes should not be included in the ration of pigs less than 4 mo. old. After this period they may replace one-third of the starchy foods until the fifth month, when the proportion may be gradually increased to a limit of two-thirds of the ration. Beyond that amount the feeding of potatoes appeared to be uneconomical. This method of disposing of low-priced potatoes was found to be profitable when the relative price of potatoes and hogs warranted the marketing of the crop in this manner.

Cost of pork production in relation to the different ages of the pigs, F. A. ALCARAZ and E. ALCASID (*Philippine Jour. Anim. Indus.*, 1 (1934), No. 3, pp. 131-146).—This experiment by the Philippine Bureau of Animal Industry was conducted to determine the age at which pigs should be marketed in order to realize the maximum profit, the effect of age on rate of gain in full-fed pigs, and the amount of feed consumed in relation to growth.

The results showed that the rate of gain in weight for a given period increased as the age of the pig increased to 1 yr., and then dropped. Maximum profits were obtained when pigs were 8 mo. old. The rate of gain increased until the pigs weighed approximately 220 lb., and then gradually decreased. The daily feed consumption per unit of weight decreased as the weight of the pigs increased, and the feed requirements per unit of gain increased for each successive interval. Dressing percentage increased with the weight of pigs.

Observations on the mineral metabolism of pullets, R. H. COMMON (*Jour. Agr. Sci. [England]*, 23 (1933), No. 4, pp. 555-570, figs. 4).—Continuing studies on mineral metabolism of poultry (E. S. R., 69, p. 570) at the Ministry of Agriculture for Northern Ireland and Queen's University of Belfast, this investigation was carried out to trace the metabolism of sodium and potassium as well as of calcium and phosphorus in the nonlaying and laying pullet.

The previous observations on calcium and phosphorus metabolism were confirmed, and the retention of these minerals was found to be related to the amount of sodium chloride in the feed. The extra phosphorus excretion accompanying egg production involved no marked concomitant changes in the amount of potassium in the droppings. Small concomitant increases in sodium in the droppings were noted when the feed contained only small amounts of sodium and chloride, and potassium retention was noted on the succeeding day in every case but one. It is suggested that the extra phosphorus excretion associated with egg production was related to a temporary draft on body reserves of calcium for shell formation. While the data presented agree with the view that phosphorus is normally excreted by the nonlaying pullet as dicalcium phosphate, it is pointed out that phosphorus excretion must take place in some other form in addition to calcium phosphates where heavy phosphorus excretion accompanies laying. The other form appeared to be water soluble, and it was possible that it was of urinary origin.

Relative utilization of calcium from calcium carbonate and calcium gluconate by chickens, J. E. HUNTER, R. A. DUTCHER, and H. C. KNADEL (*Soc. Expt. Biol. and Med. Proc.*, 31 (1933), No. 1, pp. 70-75).—In a comparison of calcium gluconate and calcium carbonate as sources of supplemental calcium for poultry made at the Pennsylvania Experiment Station, the results showed that these two sources were equally efficient for growing chicks when equivalent amounts of calcium were supplied. With laying hens the gluconate appeared to function somewhat more efficiently than the carbonate, as shown by increased eggshell, shell ash, and an increase of calcium in the egg content.

Trends in egg production, egg weight, and hatchability on low-protein and normal diets, W. A. HENDRICKS (*Poultry Sci.*, 13 (1934), No. 5, pp. 290-294, figs. 2).—Data are presented from studies by the U. S. D. A. Bureau of Animal Industry on the average hatchability of eggs, during each month of the first year of production, of pullets receiving low-protein and normal diets, together with data on average egg production and egg weight for the same birds which are included for purposes of comparison with the hatchability data.

It was found that with birds receiving a low-protein diet the trend in hatchability tended to parallel the trends in egg production and egg weight during the first years of egg production. Hatchability for birds receiving a normal diet increased during the early part of the laying year, but there was no agreement between the trend in hatchability and the trend in egg production and egg weight during the remainder of the laying year.

The inheritance of sexual maturity, rate, and persistence of laying in the domestic fowl, M. A. JULL (*Poultry Sci.*, 13 (1934), No. 5, pp. 286-289).—This paper from the U. S. D. A. Bureau of Animal Industry presents data to show that the characters sexual maturity, rate, and persistency of laying are affected by a relatively large number of genes, some of which probably influence more than one character.

Interrelationship of body weight, egg weight, and age at sexual maturity, E. W. CALLENBACH (*Poultry Sci.*, 13 (1934), No. 5, pp. 267-273).—Data obtained in investigations at the Pennsylvania Experiment Station with 803

White Leghorn and 282 Barred Plymouth Rock pullets showed that for the strains of birds considered there was no relation between pullet chick weight and subsequent body weights at 3, 8, and 16 weeks of age or at sexual maturity. There was no relation between pullet chick weight and the weight of the pullet's first egg. A large and highly significant positive correlation was found between weight at 3 and at 8 weeks of age, a moderate positive correlation between weights at 3 and 16 weeks, and a moderate positive correlation of questionable significance between weights at 3 weeks and at sexual maturity. The correlation between weights at 8 and 16 weeks was large and highly significant, and between weights at 8 weeks and weight at sexual maturity it was fairly large and highly significant. A large and significant positive correlation was observed between weight at 16 weeks and age at sexual maturity, while a moderate and significant positive correlation was found between weight at sexual maturity and weight of first egg. The correlation between weight and age at sexual maturity was large and highly significant, while the correlation between weight of first egg and age at sexual maturity was a moderate significant positive correlation for White Leghorns and a large and significant positive correlation for Barred Rocks.

Effect of X-rays upon the development of sexual characters, A. F. ROLF, C. H. SCHROEDER, and W. A. HIGGINS (*Poultry Sci.*, 13 (1934), No. 5, pp. 274-277, figs. 3).—In this study 6-week-old cockerels were exposed to roentgen rays at the rate of 1,750, 2,200, and 2,700 r. u. (roentgen units) as well as two exposures of 1,750 r. u. at intervals of 10 days.

The above treatment reduced the development of testes, comb, and wattles. Treated birds apparently lost their ability to crow, but in other respects the external characteristics were those of a "slip" rather than those of a capon. The X-ray exposure apparently did not completely inhibit the production and action of the hormone responsible for the growth of comb and wattles. The exposure used in this test significantly reduced the subsequent weight gains.

Comparative seasonal variations in egg production of Cantonese, White Leghorn, and Rhode Island Red chickens under Alabang conditions, T. V. RIGOR (*Philippine Jour. Anim. Indus.*, 1 (1934), No. 1, pp. 57-60, fig. 1).—The egg records of the White Leghorn, Rhode Island Red, and Cantonese flocks at the Alabang Stock Farm for the years 1923, 1930, 1931, and 1932 were used for this study.

For all the birds there were marked high and low levels of production. The production in January for Leghorns and Rhode Island Reds was above the average level, and gradually increased to a peak in March. With Cantonese the peak of production was reached in January. After March production declined rapidly until the low level was reached in August, when the curve again rose to December. The decline following the March peak was attributed to the fact that some of the birds began molting as early as April. The low production in August was due to the continuous rainy weather which kept the birds confined indoors.

The fertilized bird's egg as a physicochemical system, A. L. ROMANOFF (*Poultry Sci.*, 13 (1934), No. 5, pp. 283-285, fig. 1).—In this paper from the [New York] Cornell Experiment Station data are presented to show that the development of the egg into a finished embryo consists in the continuous transformation of physicochemical energy with the consequent change of the egg substance from one form into another, from a more or less uniform chemical material into visible complexity and organization.

Apparatus for studying the effect of increased atmospheric pressure upon the developing hen egg, B. CUNNINGHAM (*Science*, 80 (1934), No. 2065,

pp. 99, 100, fig. 1).—In this article the author describes an apparatus for studying the effect of increased atmospheric pressure upon the avian egg.

One cause of tremulous air cells, C. W. KNOX and M. W. OLSEN (*U. S. Egg and Poultry Mag.*, 40 (1934), No. 12, pp. 12, 13, 16, 17).—In this study at the U. S. D. A. Bureau of Animal Industry a case of eggs was shipped to Ames, Iowa, and returned, and two cases were sent to Chicago, Ill., and returned. Each case consisted of two lots of eggs packed rather loosely and three lots packed rigidly. The eggs were candled before and after shipping.

The rigid packs produced fewer tremulous air cells than the loose packs. It was evident from the data that at least one major cause of tremulous air cells was the type of container generally used, and that to a large extent this condition could be eliminated by the use of rigid-type packs. It was also found that the distance shipped and the number of handlings affected the condition of the air space.

Causes of the embryonic malposition head-under-left-wing, T. C. BYERLY and M. W. OLSEN (*Poultry Sci.*, 13 (1934), No. 5, pp. 278–282, figs. 3).—The data reported in this paper were collected at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md. Evidence is presented which demonstrates that the incidence of the malposition head-under-left-wing in the chick embryo varies inversely with variations in hatchability due to genetic or to nutritional causes, or to causes in the physical environment of the egg. It was probable that many influences that have an adverse effect on embryonic development increase the incidence of the malposition.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1934, pp. 92–94).—Brief reference is made to results of studies dealing with the outward conformation and internal anatomy and the producing capacity of dairy cows, the physiology of milk secretion, the use of roughage in dairy rations, and small packages for Cheddar cheese, Swiss cheese, and skim milk powder.

[Experiments with dairy products in California] (*California Sta. [Bien.] Rpt.* 1933–34, pp. 110–113).—In these investigations data were obtained on improving the texture of ice cream, flavors in milk, composition of milk, and the value of soft-curd milk for infant feeding.

[Dairy husbandry and dairying studies] (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, pp. 5, 6, 7, fig. 1).—Articles are included entitled Farming along the Mediterranean Sea—II, Dairy Husbandry in Italy, by R. S. Breed (p. 5), and Success in Whipping Cream Made Certain, by J. C. Henning (pp. 6, 7) (*E. S. R.*, 63, p. 670).

[Experiments with dairy cattle and dairy products in West Virginia] (*West Virginia Sta. Bul.* 263 (1934), pp. 33–36, figs. 2).—Information was obtained in studies with dairy cattle on simplified rations for the dairy cow, and sweetclover as a summer pasture. Data are reported from investigations with dairy products on flavor studies of milk and bitter flavor in sour cream.

[Experiments with dairy cattle in Wyoming] (*Wyoming Sta. Rpt.* 1934, pp. 30, 38).—Results obtained in studies with dairy cattle are reported on a comparison of alfalfa and native hay for milk production at the Afton Substation, and substituting root crops for part of the grain ration for dairy cows at the Lyman Substation.

The Hannah Dairy Research Institute annual report for the year ending 31st March, 1933 (*Hannah Dairy Res. Inst., Ann. Rpt.*, 4 (1933), pp. 20).—

This is a summary of the research work conducted at this institution with dairy cattle and dairy products (E. S. R., 68, p. 236).

Feeding dairy cows with and without grain, W. F. DICKSON and D. V. KOPLAND (*Montana Sta. Bul.* 293 (1934), pp. 23, figs. 3).—This study, conducted in cooperation with the U. S. D. A. Bureau of Dairy Industry, was planned to determine to what extent a limited feed of grain with roughage and a ration consisting of roughage alone affected the quantity of milk from Holstein cows capable of fairly high production.

When fed roughage alone 10 cows produced an average of 464 lb. of butterfat during a 365-day test, were able to produce over 13,000 lb. of milk without loss in weight, and dropped normal, healthy calves. Cows fed 1 lb. of grain for each 3 lb. of milk produced yielded 30 percent more milk than those fed roughage alone, but only 6 percent more milk than those fed grain in the ratio of 1 to 6. Feeding roughage alone or limited grain rations resulted in more efficient milk and butterfat production and a lower feed cost than full grain feeding.

Based on the average production of the cows in this test and on the average grain and alfalfa yields on irrigated lands in Montana, it is concluded that it would require 100 acres to raise feed for 21 cows on a full grain ration, 78 acres for cows on a limited grain ration, and 54 acres for cows fed alfalfa alone. It would require 66 out of each 100 acres to produce the grain for cows on a full grain ration, and 40 out of each 100 acres to produce the grain for cows on limited feed. It was also concluded that 27 cows fed roughage alone and 22 cows fed a limited grain ration produced as much milk as 21 cows fed a full grain ration.

Freshening ages of purebred cows in Iowa cow testing associations, M. PLUM and J. L. LUSH (*Jour. Dairy Sci.*, 17 (1934), No. 9, pp. 625-638, figs. 5).—The data for this study at the Iowa Experiment Station were obtained from the record books of owners who had been members of the Iowa cow testing associations for at least three consecutive years. Nearly 73 percent of the records examined were concerned with Holsteins.

It was found that the mean age at which 570 registered heifers first freshened was 27.1 mo., but the distribution was decidedly skewed with the mode at 24 mo. More than half of the heifers freshened before they were 25½ mo. old. Some significant differences were found among the different breeds studied. Differences between herds were large enough to show a variation in management policy regarding breeding or an effective difference in herd environment. There was a distinct cycle in the number of cows calving at various ages, the peaks being 12 mo. apart and starting at 24 mo. The distribution should be taken into account in studying the relation of other variables to age at calving.

Average period required for conception after calving in Sindhi cows, C. N. DAVE and H. SINGH (*Agr. and Livestock in India*, 4 (1934), No. 3, pp. 270-274).—A study at the Imperial Institute of Animal Husbandry and Dairying, Bangalore, showed that the average period required by a Sindhi cow for conception after calving was 118 days. This period was about 18 days shorter for stock bred at the institute than for purchased stock. Further studies of breeding records showed that the greatest number of cows were served during the months of January and February and the fewest in May.

Conformation of the cow as related to milk secretion, Jersey Registry of Merit, J. W. GOWEN (*Jour. Agr. Sci. [England]*, 23 (1933), No. 4, pp. 485-513, figs. 6).—Based on measurements of about 300 bulls and 6,000 cows of the Jersey breed, the author presents an analysis of the relation borne by eight

body measurements and age to the cow's milk-producing capacity. The analysis was made from the viewpoint of conformation as related to milk production without regard to age, when age was considered, and conformation as a whole and its relation to milk secretion.

The following points of conformation were found to be important: (1) Better than average weight for breed and age, (2) a good wedge-shaped form, particularly in the region of the shoulders, (3) milk veins of good size, and (4) udder of good size and quality.

The author points out that if the measure of merit is the relation of energy intake in the feed consumed to the energy found in the milk the effect of weight on quantity of milk produced would be offset by the extra energy required to maintain the weight. While the cow's conformation, as a whole, was an inferior means of predicting future milk-producing capacity, it did show the present status of the cow's physical health and the condition of the mammary system.

The conformation of the parents as related to the milk secretion of the daughters, Jersey Registry of Merit, J. W. GOWEN (*Jour. Agr. Sci. [England]*, 23 (1933), No. 4, pp. 514-518).—Continuing the above study, an analysis was made of the performance of 208 Jersey cows with Registry of Merit records by sires whose measurements had been taken and of 122 cows from measured dams. With the possible exception of weight, there was no correlation of practical significance between the body type of the sire or dam and the productive capacity of the daughter in milk, butterfat, or butterfat percentage.

[Dairying experiments in New York] (*New York State Sta. Rpt.* 1934, pp. 16-18, 38, 39).—Data are reported on increasing the accuracy of bacterial counts of milk, fruit flavor for ice cream, and pasteurization of cream.

The application of X-rays to research in dairy technology, S. L. TUCKEY, H. A. RUEHE, and G. L. CLARK (*Jour. Dairy Sci.*, 17 (1934), No. 9, pp. 587-594, figs. 7).—This preliminary study was undertaken at the Illinois Experiment Station to determine some of the limitations and adaptations of X-rays to research in dairy products.

The results from the diffraction of X-rays by milk powder showed conclusively that lactose does not exist in a crystalline form in fresh milk powder. From the diffraction patterns obtained it was possible to show the very onset of lactose crystallization in the milk powder. It was noted that there was a tendency for a change of spacing of the diffracting group in milk protein due to different processing methods. Spray powders had a slightly greater d_1 unit spacing than roller powders.

The effect of feeding on the fat content of cows' milk, E. J. SHEEHY (*[Irish Free State] Dept. Agr. Jour.*, 32 (1933), No. 1, pp. 18-29+[11], figs. 14).—A series of experiments covering a period of 4 yr. was undertaken by the animal nutrition department of University College, Baile Atha Cliath (Dublin), to determine the influence of the type of feed consumed on the fat content of the milk produced.

The following oils and fats had no specific effect on the yield of butterfat—olive oil, linseed oil, cottonseed oil, coconut oil, peanut oil, palm nut oil, soybean oil, beef fat, and sperm oil. The same was true of palm nut cake, cottonseed cake, and linseed cake when fed up to 6 lb. per head daily. Cod-liver oil fed at the rate of 6 oz. per head daily had a depressing effect on fat production that lasted for several days after oil feeding was discontinued. The amount of fat in the diet required for the production of the maximum butterfat in the milk was so small that ordinary feeding supplied the necessary quantity.

The author points out that because one or more cows occasionally respond by way of increased or decreased butterfat to certain feeds is not proof of a specific quantitative effect of the feeds on butterfat. Neither the amount of water consumed nor the succulence of the ration affected the percentage of fat in milk, nor was there any connection between the plane of nutrition and the amount of fat produced. Feeding separated or whole milk powders did not increase fat percentage, and it is suggested that the possible effect of whole milk and cream in raising the fat of milk could be attributed to some substance or substances other than fat per se.

Irradiated milk: The reflecting properties and antirachitic activation as affected by the impingement angle of the incident radiation, G. C. SUPPLEE and M. J. DORCAS (*Jour. Dairy Sci.*, 17 (1934), No. 9, pp. 607-611, fig. 1).—Continuing this study (E. S. R., 72, p. 378), it was found that the reflection of ultraviolet radiation from the surface of milk films was of the same order of magnitude as the reflection of such radiation from the surface of water. In other words, the degree of reflection increased as the angle of incidence decreased.

Ultraviolet radiations, between 2550 and 3000 a. u. when impinged on milk surfaces at angles of 75° and 45° from parallel were reflected approximately 3 percent, the average reflection from a 30° angle of incidence was about 6 percent, from a 20° angle 13.4 percent, from a 15° angle 28 percent, and from a 10° angle about 34 percent. The films had the property of selective reflection of ultraviolet radiation, especially through the range of 2550 to 3300 a. u., and this property was most pronounced at angles of incidence of 30° or less. When other factors were equal the antirachitic potency of irradiated milk was the same when the angle of incidence of radiation was 30° as when it was 90°.

Numbers of microorganisms falling from the air in dairy plants, H. C. OLSON and B. W. HAMMER (*Jour. Dairy Sci.*, 17 (1934), No. 9, pp. 613-623, figs. 4).—A study was undertaken at the Iowa Experiment Station to determine the numbers of bacteria, yeasts, and molds falling from the air in rooms in which dairy products were handled and also from outside air, the influence of season on the numbers of organisms falling, and the effect of a muslin covering on the numbers of organisms falling on a surface.

It was found that bacteria, yeasts, and molds were rather constantly falling on exposed agar in three dairy laboratories and one experiment station laboratory and on two outside exposures. Bacteria were generally the most numerous and yeasts the least numerous. There was no great difference in the numbers of organisms falling outdoors and those falling indoors, nor was there any distinct seasonal variation in the number of organisms falling at the various locations. A muslin cover reduced the number of organisms falling on a surface from the air.

Some observations on species of *Actinomyces* found in samples of milk, C. H. CHALMERS (*Zentbl. Bakt. [etc.]*, 2. Abt., 87 (1932), No. 1-4, pp. 1-26, fig. 1).—An investigation at the University of Leeds, England, was undertaken to determine the frequency of occurrence of species of *Actinomyces* in milk and to study the nature of some of the changes they produce.

Only about 5 percent of the milk samples examined contained these organisms, the numbers being greater during the winter than during the summer months. The organisms were probably present in the conidial form. The variety of strains of *Actinomyces* present in milk was very great and their identification difficult. The organism grew slowly in milk even when incubated at 25° C., and no marked changes appeared to take place in the milk until after it had been incubated at the above temperature for 1 week. A

comparatively heavy contamination was necessary before the characteristic earthy smell of the organism was produced, and even then it was necessary to incubate the milk for from 4 to 7 days. All the strains observed could withstand a temperature of 60°, but only 4 survived 65° for 30 min.

Appended is a description of the cultural characters on solid and liquid media of each strain of organism examined.

Straining milk on the farm, A. C. DAHLEBERG (*New York State Sta. Circ.* 155 (1934), pp. 4, figs. 2).—The factors to be considered in buying a strainer, the use of cotton pads or filter cloths, the construction of strainers for the two types of straining materials, and factors affecting the straining of milk on the farm are discussed.

The bacteriological examination of raw milk by means of the milk agar plate count method, S. B. THOMAS (*Welsh Jour. Agr.*, 10 (1934), pp. 295–301, figs. 3).—Studies at University College, Aberystwyth, showed that the addition of sterile milk to standard agar had a favorable influence on the number and size of colonies that develop during the examination of raw milk samples. However, with pasteurized milk the increase in numbers of colonies was not as significant as that reported by other workers.

Some observations on the methylene blue reductase test, C. S. MILES (*Jour. Min. Agr. [Gt. Brit.]*, 40 (1933), No. 5, pp. 414–419).—Studies at the University of Bristol, England, indicated that the reductase test was not satisfactory in examining milk of low bacterial count, and as compared with the plate count did not constitute a fair means of determining bonus payments for milk. If the keeping-quality test was regarded as a measure of the commercial value of milk, the results of the plate count were more indicative of commercial utility than were those of the reductase test.

Experiments with the methylene blue reduction test for the grading of sweet cream, H. MACY (*Minnesota Sta. Bul.* 310 (1934), pp. 18, figs. 5).—The need for a rapid and simple test for distinguishing inferior and superior lots of sweet cream led to investigations with the methylene blue reduction test for cream.

It was found that a triple strength solution of methylene blue was superior for cream to the solution recommended for milk in the Standard Methods of Milk Analysis. The reduction time for the methylene blue was inversely proportional to the bacterial content of the cream. In samples of cream having less than 0.21 percent acidity the reduction time showed no direct relationship to the acidity. The percentage of fat in the cream did not significantly influence the reduction time.

This test was found to be a satisfactory index of bacterial content of cream and could be used for cream grading. The reduction time reflected the sanitary conditions under which the cream was produced and the methods of cooling. Both salted and unsalted butter made from better quality cream had better storing qualities than butter from inferior cream, but the differences were not marked.

Appended is information on the use of the methylene blue reduction test for sweet cream, the apparatus necessary for the test, collection of samples, adding the methylene blue, reading the test, and grading the cream.

The use of sediment tests for grading cream, E. L. FOUTS (*Oklahoma Sta., Cur. Farm Econ.*, 7 (1934), No. 6, pp. 122, 123).—A satisfactory method for determining the amount and kind of insoluble material in cream was developed. The procedure followed was to place in a 500-cc glass beaker 17.5 cc of a solution made by adding to 321 g of commercial 58-percent soda ash enough clean water at 150° F. to make 1 gal. To this was added approximately 75 cc

of boiling water and 2 oz. of the cream to be tested. After stirring thoroughly while adding, the mixture was allowed to stand for 2 min. and then filtered through a cotton or nainsook sediment pad at about 170°. The amount and type of sediment could then be observed on the pad. The cost of the material was about 2 ct. for 100 tests.

A study of seasonal variation in butter-fat.—I, Seasonal variations in carotene, vitamin A, and the antimony trichloride reaction, R. G. BOOTH, S. K. KON, W. J. DANN, and T. MOORE (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1189–1196, figs. 2).—The seasonal variations in the carotene and vitamin A contents of typical English butter from Shorthorn cows were determined by the colorimetric method at the National Institute for Research in Dairying. The determinations for intensity of yellow color were made on untreated butterfats. The antimony chloride blue values were determined both on the untreated fats and the corresponding nonsaponifiable residues.

The results on yellow color and blue value were in good agreement with the established variation of the carotene and vitamin A contents of the butter corresponding to the amount of green material in the diet of the cow. Blue values determined on untreated butterfat were valueless as a guide to vitamin A content. However, these values did show a qualitative difference in the behavior of the colors produced by "winter" and "summer" butterfats due to an inhibitory substance present in greater concentration in the summer fats.

In practical assays for total vitamin A activity by colorimetric means it was concluded that both vitamin A and carotene contents should be taken into account. The total vitamin A activity of the summer butterfat appeared to be three times greater than that of winter fat, and the fraction of total activity due to carotene was also greater in summer butterfat. A suggested formula for calculating the total vitamin A activity is presented.

The vitamin D activity of butter.—I, A chemical differentiation of the antirachitic factor of autumn and winter butter from irradiated ergosterol and the vitamin D of cod-liver oil, S. K. KON and R. G. BOOTH (*Biochem. Jour.*, 27 (1933), No. 4, pp. 1302–1309, pl. 1).—In determining the vitamin D content of the above-described butterfat, it was found that autumn and winter butters, saponified either by boiling for 1 hr. with potassium hydroxide or by heating with alkali for 2 min., lost 80 percent of their antirachitic potency as estimated by prophylactic tests with rats. Under exactly similar conditions, irradiated ergosterol or cod-liver oil could be subjected to saponification either alone or mixed with butter without loss of potency. These results indicated that a specific destructive factor did not exist in butter, and tended to show a true chemical difference between the antirachitic factor of butter and those of irradiated ergosterol and cod-liver oil.

The effect of salt on the quality of Cheddar cheese, W. RIDDET, G. M. VALENTINE, F. H. McDOWALL, and L. A. WHELAN (*New Zeal. Dept. Sci. and Indus. Res. Bul.*, 37 (1933), pp. 19, figs. 5).—Investigations at the Massey Agricultural College were undertaken to determine the influence of the proportion of salt added and the time of salting of both normal and overmoist curd on the quality of the resultant cheese.

Salting normal curd at the rate of 2.25 percent, based on the weight of cheese at milling, gave a cheese less open in texture and with better body than salting at rates of 3.25 and 4.25 percent. Cheeses from curd salted at full acidity were of better quality than those from curd salted immediately after milling or 20 min. after milling. Adding 3.25 percent of salt to overmoist curd gave better results than either 2.25 or 4.25 percent salt, but in no case was the resultant cheese of satisfactory quality.

Analyses of cheeses of tender, normal, and harsh body showed that in general the harsh body was due to oversalting of the curd during manufacture. Tables are presented giving the approximate amounts of salt that should be added per 1,000 lb. of milk for milks of different fat contents.

A bacterial color defect in Gouda cheese [trans. title], J. VAN BEYNUM (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag, 1932, pp. 199-207, pls. 4; Eng. abs., p. 207*).—The fresh cut surface of certain Gouda cheeses showed a considerable number of short, red-colored lines, much like veins. Under the microscope the veins were found to consist of a compact mass of bacteria. They could be grown only in anaerobic cultures on whey gelatin, and a pigment was produced only in solid media. The organism was of rod form, belonged to the group of lactic acid bacteria, was nonmotile, Gram-positive, catalase-negative, and nonliquefying. When cultivated in milk it produced from the carbohydrates inactive lactic acid, acetic acid, and carbon dioxide. The organism developed very slowly in milk. Upon plating a pure culture in milk on whey gelatin, a differentiation appeared to have taken place as different types of colonies were observed, but each colony type again formed red pigment when cultivated anaerobically.

The bacteriology of Swiss cheese.—I, Growth and activity of bacteria during manufacturing processes in the Swiss cheese kettle, W. C. FRAZIER, G. P. SANDERS, A. J. BOYER, and H. F. LONG (*Jour. Bact., 27 (1934), No. 6, pp. 539-549*).—The U. S. D. A. Bureau of Dairy Industry made bacterial counts and pH determinations on the kettle contents during the manufacture of Swiss cheese. Samples were taken for examination after the addition of the starters, just before the heat was turned on for cooking and just before the curd was dipped.

It was found that *Streptococcus thermophilus* (C₃ strain) usually increased in numbers during the whole process, but the increase was most rapid during the latter part of the process when the temperature of the kettle was higher. There was no increase in the numbers of *Lactobacillus casei* (39a strain) or *L. bulgaricus* (Ga strain) in the kettle and usually a decrease in numbers by dipping time. *Propionibacterium shermanii* did not increase and often decreased slightly in numbers during the kettle process. Other lactate-fermenting bacteria slowly increased. When the gas-forming bacteria of the colon-aerogenes group were found in the original kettle milk there was little or no increase in numbers, but when present in large numbers they showed a marked increase during the kettle process. *S. lactis* bacteria usually increased in numbers during the first part of the process, but were stopped by the cooking temperatures.

The pH of the kettle contents decreased slightly during the process, but this change was apparently due to physicochemical rather than to bacteriological causes.

Starters and starter making in cheese factories and creameries, P. TOENS (*Union So. Africa Dept. Agr. Bul. 133 (1934), pp. 19, figs. 7*).—In this bulletin from the School of Agriculture, Glen, Orange Free State, the author gives practical suggestions on starters and starter preparation in the dairy industry.

A study of the kefir microflora for the purpose of its preparation with pure cultures [trans. title], L. STARYZINA (STARYGHINA) and M. KHALDINA (CHALDINA) (*Mikrobiologiču, 3 (1934), No. 1, pp. 88-102; Eng. abs., p. 102*).—In studies at the branch of the Institute of Agricultural Microbiology at Moskva (Moscow), it was found that lactic acid streptococci made up 94 percent, lactic acid rods 6 percent, and yeasts 0.1 percent of the total microflora of kefir. The lactic acid streptococci carried out the main lactic acid

production and largely determined the accumulation of acidity, the setting of milk, and the pleasant taste. The lactic acid bacteria were largely responsible for the desirable consistency and in the ripened product for the higher acidity. The milk yeasts were the agents for alcoholic fermentation, determining the pungency of taste and producing the CO₂ that makes kefir a gaseous product. Peptonizing bacteria determined the characteristic flavor and were partially responsible for the consistency of the product. A method for the preparation of starters by combining pure cultures in proper amounts was worked out.

An investigation on the peptonizing bacteria of kefir (Caucasian fermented milk) [trans. title], S. A. SAMTSEVICH (SAMTZEVICH) (*Mikrobiologiia*, 3 (1934), No. 1, pp. 103-109; *Eng. abs.*, p. 109).—The peptonizing bacteria regularly present in kefir improved the consistency and were responsible for the specific flavor of the product. In the early stages of development these bacteria produced proteolysis in milk, thus assisting in a more energetic development of the lactic acid bacteria. When simultaneously cultivated with lactic acid streptococci, the lactic acid produced by the latter organism depressed the growth of the peptonizing bacteria. Pure cultures of the peptonizing bacteria produced obvious peptonization of milk in 24 hr. With time this power increased, and some cultures were capable of entirely splitting casein. Shaking kefir after the acidity had reached a high level had a depressing effect on the peptonizing bacteria, and if shaking was continued these organisms were completely destroyed by the end of 24 hr. This action was believed to be due to the destruction of a "defense zone" formed by the fermentative action of the bacteria in the coagulating casein.

The apparent viscosity of ice cream.—I, The sagging beam method of measurement. II, Factors to be controlled. III, The effects of milkfat, gelatin, and homogenization temperature, A. LEIGHTON, A. LEVITON, and O. E. WILLIAMS (*Jour. Dairy Sci.*, 17 (1934), No. 9, pp. 639-650, figs. 8).—The U. S. D. A. Bureau of Dairy Industry describes the development and application of the sagging beam method of viscosity measurement to ice cream. The paper also describes the effect of certain variables such as fat concentration, gelatin concentration, and homogenization temperature on the viscosity of ice cream. A detailed study was made of such factors of normal manufacture as overrun, temperature of drawing, etc., which would affect viscosity, so that a standard procedure could be developed for determining viscosity.

It was found that fat and gelatin concentration in some way acted to produce the same general effect upon the viscosity of ice cream. Increasing the temperature of homogenization tended to reduce the quantity of either material needed to produce the same general effect.

It is pointed out that while the absolute viscosity value of ice cream is not a direct measure of quality, in a series of ice creams in which one factor is varied, viscosity is an indication of changes in quality and of the physical action of that factor in ice cream.

A study of the causes of a stale, metallic flavor in strawberry ice cream, together with tests of methods of packing berries, P. H. TRACY, R. J. RAMSEY, and H. A. RUEHE (*Illinois Sta. Bul.* 407 (1934), pp. 409-430).—Continuing this study (*E. S. R.*, 71, p. 241), further investigations were made on the cause of the stale, metallic, or tallowy flavor of strawberry ice cream, and the relative merits of six common varieties of strawberries were tested for flavor.

Eliminating copper contamination was the most necessary step in preventing the development of the metallic flavor. This off flavor was associated with the oxidation of butterfat, and copper catalyzed oxidation reaction. The devel-

opment of the flavor could be retarded by homogenizing the mix at high pressure, by heating the apparatus, by soaking the fruit in the mix before freezing, or by increasing the amount of fruit added or by increasing the fiber content of the berries. It is believed that strawberries contained two agents affecting fat oxidation, one serving as a catalyst and the other as a reducing agent. The former was contained in the juice and the latter associated with the fibrous material. An increased citric acid content of the berries did not hasten the development of the flavor defect.

Different commercial pack berries varied in their ability to cause the stale, metallic flavor, probably because of differences in concentration of pack or the proportion of fiber as well as the heat treatment given berries before or after canning. Other fruits such as oranges, lemons, and pineapple accelerated the reaction responsible for the flavor. The varieties tested ranked in the following order of preference: Dunlap, Parson Beauty, Gandy, Premier, Gibson, and Aroma. A desirable pack so far as flavor was concerned was made up of either 2, 3, or 4 parts of berries to 1 part of sugar. When it was desired to keep the berries whole, a pack of 3 or 4 parts of berries to 1 part of sugar or 40 percent sugar sirup solution was preferable.

VETERINARY MEDICINE

The operative technic of animal experiments, H. F. O. HABERLAND (*Die operative Technik des Tierexperimentes. Handbuch der biologischen Arbeitsmethoden, Abt. V, Teil 3C, Heft 1. Berlin and Wien (Vienna): Urban & Schwarzenberg, 1934, V, pt. 3C, No. 1, pp. XI+434, figs. 382*).—This is a detailed account of methods employed in experimental work with laboratory animals.

[Contributions on ecto- and endo-parasites] (*Jour. Parasitol.*, 20 (1934), No. 6, pp. 323, 324, 325, 326, 328, 329, 330, 331, 332, 334, 335, 337, 338, 339).—Continuing the contributions previously noted (*E. S. R.*, 71, p. 243), those presented at the annual meeting of the American Society of Parasitologists held in Pittsburgh, Pa., in December 1934 include the following: Resistant and Susceptible Strains of White Minorca Chickens to the Nematode *Ascaridia lineata* (Schneider), by J. E. Ackert and J. H. Wilmoth (pp. 323, 324); The Effect of Daily Administrations of Ferrous Sulphate and Copper Sulphate to Pigs on Their Resistance to Infection with the Swine Nodular Worm, *Oesophagostomum dentatum*, by L. A. Spindler (pp. 325, 326); Development of *Ancylostoma caninum* Following Percutaneous Infection, by B. Schwartz and J. E. Alicata (p. 326); The Life History of the Black Grub of Bass, *Crassiphiala ambloplitis* (Hughes), by G. W. Hunter, III, and W. S. Hunter (p. 328); Immunity in Rabbits against One of Its Cestode Parasites, *Cysticercus pisi-formis*, by K. B. Kerr (p. 328); Periodicity in the Oocyst-Production of the Pigeon *Eimeria*, by D. C. Boughton (p. 329); The Development of Resistance to the Protozoan Parasite *Eimeria tenella* by the Chicken, by C. A. Herrick (pp. 329, 330); Chronic Avian Coccidiosis, by W. T. Johnson (pp. 330, 331), contributed from the Oregon Experiment Station; The Incidence of Coccidia [Principally *Isospora lacazii*] in the Common English Sparrow (*Passer domesticus*), by L. V. Skidmore (p. 331); Resistance and Susceptibility in Coccidial Infections, by J. Andrews (p. 332); The Nature of Immunity in Coccidiosis, by E. R. Becker (p. 332); Species of *Capillaria* Parasitic in the Upper Digestive Tract of Domestic and Game Birds, by E. B. Cram (pp. 334, 335); Conjunctival Ophthalmomyiasis Caused by *Oestrus ovis*, by M. W. Lyon, Jr. (p. 337); A Destructive Outbreak of the Screw Worm Fly, *Cochliomyia* spp., in the Southeast, by F. C. Bishopp (p. 337); Dikes and Automatic Tide Gates in Control of

Sand Flies and Salt Marsh Mosquitoes, by W. E. Dove and D. G. Hall (pp. 337, 338); Epizootic Tick-Borne Tularaemia in Sheep in Montana, 1934, by C. B. Philip (p. 338); and Production of Maggots for Surgical Use—I, Disinfection of Eggs, by G. F. White (pp. 338, 339).

The interrelation of the parasites of domestic and wild animals (*Wyoming Sta. Rpt. 1934*, p. 29).—Brief reference is made to the infestation of tame rabbits following grazing on areas frequented by wild rabbits and to the acute injury to sheep caused by *Sarcocystis tenella*.

[Work with diseases of livestock at the California Station] (*California Sta. [Bien.] Rpt. 1933-34*, pp. 87-93).—In this brief discussion of the work of the biennium (E. S. R., 69, p. 104) particular consideration is given to that with bovine tuberculosis, Bang's disease, and anaplasmosis of cattle, and a new swine disease differing from foot-and-mouth disease and vesicular stomatitis for which the name "vesicular exanthema of swine" is recommended. Bang's disease in swine and a tissue vaccine for hog cholera are briefly mentioned, followed by references to infectious encephalomyelitis of horses and mules, use of thiocresol for treatment of summer sores in horses, paratuberculous enteritis of sheep, polyarthritis of lambs, treatment of foot rot in sheep and cattle, laryngotracheitis and a gasping disease of chicks which closely resembles it, several types of coryza or cold in chickens, pullorum disease, and chronic coccidiosis.

Annual report of the veterinary department for the year 1933, S. H. WHITWORTH (*Straits Settlements Vet. Dept. Ann. Rpt., 1933*, pp. 9).—A brief account of the infectious diseases of livestock and their control is included in this report.

Recent advances in vaccine and serum therapy, A. FLEMING and G. F. PETRIE (*London: J. & A. Churchill, 1934*, pp. X+463, figs. 3).—In part 1 of this digest (pp. 1-242) recent advances in serum therapy are dealt with by G. F. Petrie, and in part 2 (pp. 243-446) vaccine therapy by A. Fleming. Included among the total of 44 chapters are those on the employment of vaccines and sera in veterinary practice (pp. 215-242) and the prevention of certain animal diseases by the administration of formol cultures (pp. 442-446). Indexes of subjects and of authors are included.

[Work with plants poisonous to livestock at the Wyoming Station] (*Wyoming Sta. Rpt. 1934*, pp. 17-20).—Reference is made to the finding of *Oenopsis condensata*, somewhat resembling the woody aster, to be extremely poisonous to livestock, giving symptoms of selenium poisoning, and the results of a further study of poisonous minerals in plants (E. S. R., 70, p. 829).

Some important poison plants of North Australia, compiled by H. FINNEMORE ET AL. (*Aust. Council Sci. and Indus. Res. Pam. 49 (1934)*, pp. 44, figs. 16).—Following a brief introduction, the authors consider the classification of poisons, the diagnosis of cases of poisoning, the treatment of stock suffering from plant poisoning, and precautionary measures, and give descriptions of individual poison plants, 17 in number.

The effects of fluorine on respiration, blood pressure, coagulation, and blood calcium and phosphorus in the dog, D. A. GREENWOOD, E. A. HEWITT, and V. E. NELSON (*Jour. Amer. Vet. Med. Assoc., 86 (1935)*, No. 1, pp. 28-42, figs. 5).—In experimental work in Iowa, fluorine as sodium fluoride, when injected intravenously at levels from 1.5 to 5.3 mg per kilogram of body weight, was found to cause a detectable effect on respiration in dogs. "Intravenous injection of 16 to 31.7 mg of fluorine as sodium fluoride per kilo of body weight in dogs causes a detectable lowering of blood pressure. Oral administration of 0.45 mg to 4.52 of fluorine as sodium fluoride per kilo of body weight caused

no effect on total calcium, acid-soluble inorganic phosphorus, hemoglobin, or coagulation time of blood. Dogs developed mottled enamel of the permanent teeth when given orally fluorides or water containing fluorides. Radiographs show no changes in the bones of dogs receiving as much as 4.52 mg of fluorine as sodium fluoride orally per kilo of body weight."

A list is given of 22 references to the literature.

Selenium toxicity (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1934, p. 5*).—Brief reference is made to studies of the relation of selenium compounds to alkali disease, previously noted (*E. S. R., 72, p. 252*).

Studies on the differentiation of *Brucella* [trans. title], U. PAGNINI (*Bol. Ist. Sieroterap. Milan, 13 (1934), No. 3, pp. 145-180; Eng. abs., pp. 177-179*).—This contribution, presented with a list of 97 references to the literature, reports upon investigations conducted with a view to determining the differential value of the H₂S test and that of bacteriostasis of dyes, in the course of which 108 strains were employed.

***Brucella abortus* infection: Serum experiments in small animals**, R. GWATKIN (*Canad. Pub. Health Jour., 25 (1934), No. 8, pp. 403-406*).—Contributing from the Ontario Research Foundation, the author reports having been able to protect guinea pigs against exposure by mouth and eye with *B. abortus* through repeated intraperitoneal injections of antiabortus guinea pig, rabbit, cow, and horse serum. "The best results were obtained with guinea pig and rabbit serum. Cow serum was the least satisfactory. Bovine serum, following repeated injections of cows with living *B. abortus*, was not more protective than that obtained from cases of natural infection.

"These experiments show that protective antibodies appear in the blood following injections of living *B. abortus*, and are present in natural infection, although decidedly variable in both cases. All the control animals became infected. We have not had a failure to infect guinea pigs by the methods employed in any of our experiments during the last 3 yr. No guinea pig vaccinated with killed cultures of filtrates has shown any resistance, whereas some of the serum treated animals have been definitely protected. Three criteria were demanded as evidence of freedom from infection, namely, absence of lesions, negative cultural results, and absence of agglutinins and complement-fixing bodies, because lesions are sometimes absent; cultures may prove negative, even though the animal has a positive blood reaction or lesions; and some animals negative to both tests have yielded *B. abortus* on culture.

"As would be expected, different lots of pooled serum varied in protective power, but with the 5 cc dose and repeated injections some protection was evidenced in each group. These sera did not show any bactericidal activity in vitro."

The carrying of bacilli by gray rats infected with the bacillus of Danitch [trans. title], E. F. ROZENFEL'D (ROSENFELD) (*Trudy Vsesoiūzn. Inst. Selsk. Khoz. Mikrobiol. (Bul. State Inst. Agr. Microbiol. U. S. S. R.), 5 (1933), pp. 217-221; Eng. abs., p. 221*).—In experiments conducted with a view to determining the conditions under which gray rats become carriers of bacilli when infected with the bacillus of rat typhus, 108 animals were tested. One group was inoculated with a virulent culture of the bacillus of Danitch, another with a weakened culture, and 11 animals were left as controls.

In 32 percent of the rats inoculated with the virulent culture, bacilli were found in the excrements, while 39.8 percent carried bacilli in their organs. The percentage of positive reactions of the blood in this experiment was 64.5. The rats inoculated with the weakened culture were not carriers of bacilli; the percentage of positive reactions of the blood was 20.4. No reactors were

found among the controls. During the period of infection of the rats with the virulent culture, from the fifth to the fourteenth day of the disease, the bacilli were eliminated in the excrement of 100 percent of the animals. The transmission of the infection from diseased rats to healthy rats kept together with the former was observed in 2 of 8 cases. It is concluded that the transmission of the infection through the carrying of bacilli takes place chiefly during the period of illness.

Foot-and-mouth disease: The fixed virus types, R. DAUBNEY (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 4, pp. 259-281).—This contribution, the details of which are presented in tabular form, is based upon investigations conducted in Kenya.

The differentiation of the virus of vesicular stomatitis from the virus of foot-and-mouth disease by filtration, I. A. GALLOWAY and W. J. ELFORD (*Brit. Jour. Expt. Path.*, 14 (1933), No. 6, pp. 400-408).—In the investigations reported it is shown that "the virus of vesicular stomatitis has a particle size of 70 to 100 μ . This size value, which is the same for both the 'Indiana' and 'New Jersey' strains of the virus, is about eight times that previously estimated for the virus of foot-and-mouth disease (8 to 12 μ). This is regarded as direct evidence of the distinct individuality of the two diseases."

The life cycle of the ground squirrel (*Citellus pygmaeus* Pall.) and the laws of development of the plague epizootic.—I, The physiological changes in the organism of the ground squirrel in the course of their life cycle [trans. title], N. I. KALABUKHOV (KALABUCHOV) and V. V. RAEVSKIĬ (W. RAEVSKY) (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.)*, 13 (1934), No. 3, pp. 223-233, figs. 2; *Eng. abs.*, pp. 232, 233).—This first contribution reports upon observations of the physiological changes in the ground squirrel (*C. pygmaeus*) in the course of its life cycle.

A short history of surra treatment in the Punjab (*Indian Jour. Vet. Sci. and Anim. Husb.*, 4 (1934), No. 3, pp. 232-241).—A review of surra treatment presented without references to the literature.

The hygienic interrelationship of human and animal tuberculosis, A. M. WAHBY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 143 (1934), pp. 25).—This contribution is presented with a list of 58 references to the literature.

An organism discovered in Tunisia having the characteristics of *Bacterium tularense* [trans. title], C. ANDERSON (*Arch. Inst. Pasteur Tunis*, 23 (1934), No. 1, pp. 53-59, fig. 1).—The author has isolated an organism from a rabbit found dead in a breeding establishment in Tunis that appears to be *B. tularense*.

Tularemia epizootic among the rodents of subfamilies Microtinae and Murinae as a causal factor of human infection [trans. title], V. A. BERDNIKOV (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.)*, 13 (1934), No. 1, pp. 61-67; *Eng. abs.*, pp. 66, 67).—The spontaneous tularemia epizootics reported from the U. S. S. R. are said to have been among water rats (*Arvicola amphibius*), with only a few indications of epizootics among hares. In some instances, these carriers do not account for the origin of tularemia outbreaks among human beings and there are thought to be others involved in the preservation of the tularemia virus in nature. An epizootic among *Mus musculus* and possibly *Microtus arvalis* was responsible for an epidemic of tularemia during the winter of 1933. It is considered highly probable that the tularemia epizootic of November-December 1933 appeared among members of the subfamilies Microtinae and Murinae as the result of a close contact with the water rats, although no epizootic had been observed among the latter.

On the fate of the bacillus of the typhus of marmots in the organism of fleas [trans. title], I. IOFF and M. POKROVSKAĬA (POKROVSKAYA) (*Trudy Vsesoiuzn. Inst. Selsk. Khoz. Mikrobiol. (Bul. State Inst. Agr. Microbiol. U. S. S. R.)*, 5 (1933), pp. 222-230; *Eng. abs.*, p. 230).—In the experiments reported it was found that the feeding of the fleas on the diseased animal led to the infection of 66 percent of them with the bacillus of marmot typhus (*Bacillus typhi spermophilorum*). As a rule, however, the infected flea freed itself from the microbe in 3 to 4 days.

Normal blood picture of horned cattle [trans. title], Z. IVAN (*Vet. Arhiv*, 5 (1935), No. 1, pp. 10-29; *Eng. abs.*, p. 29).—The author has found normal cattle blood to contain an average of 6,116,900 red and 7,008 white blood corpuscles in 1 mm³ of blood. Young horned cattle have higher erythrocyte and leucocyte counts than do adults, with males (oxen) higher than females (cows).

A list is given of 29 references to the literature.

Poisoning in cattle by passage of nicotine through the intact hide [trans. title], F. M. DE LEUR (*Tijdschr. Diergeneesk.*, 61 (1934), No. 21, pp. 1160, 1161; *Ger., Eng., Fr. abs.*, p. 1161).—Four cows which had been protected against flies by moistening the back and croup with a mixture consisting of 200 g of nicotine, 1 kg of soap, and 100 l of water died of nicotine poisoning within 2 hr. following the application. It is said that only 80 g of the liquid (160 mg of nicotine) had been used.

The acid-base balance in cows and ewes during and after pregnancy, with special reference to milk fever and acetonemia, J. SAMPSON and C. E. HAYDEN (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 1, pp. 13-23, figs. 2).—This contribution, presented with a list of 31 references to the literature, reports the results of studies made with cows (pp. 14-17) and with ewes (pp. 17-20).

The findings are considered to warrant the conclusion that "the alkali reserve is slightly lower in pregnancy (especially near the end) than during the first few days and perhaps weeks after parturition in cows. The serum calcium and the blood ketones are slightly higher in pregnancy than during the first few days after parturition in cows. There is a lowering of the alkali reserve and serum calcium in (1) milk fever, (2) milk fever with acetonemia, and in (3) acetonemia of cows. The calcium average is about one-half the normal average in the first two of these disturbances. The ketones of the blood and urine show an increase, especially in those cases classed as a combination of milk fever with acetonemia and as acetonemia. In the latter disorder, the increase may be more than 20 times greater than the normal average for blood and over 150 times the normal average for urine (expressed as milligrams of acetone per 100 cc). The average for urine ammonia-N shows a definite increase beyond the normal range in milk fever complicated with ketosis and in those cases classed as acetonemia. The alkali reserve, serum calcium, blood and urine ketones, and urine ammonia-N are within the normal range in a surprisingly large number of abnormal conditions in cattle.

"The data accumulated in these studies of several of the postparturient diseases of cows suggest the existence of a close etiological relationship between milk fever and acetonemia. A marked ketosis and an extremely high ketonuria are usually associated with pregnancy disease of ewes. It is highly probable that the essential cause of the severe ketosis associated with acetonemia of milk cows and pregnancy disease of ewes is a disturbance in carbohydrate metabolism, due either to a lack of sufficient carbohydrate or carbo-

hydrate-forming material in the ration or to an insufficient supply of carbohydrate stored in the body."

Mycotic affections of the bovine reproductive system, E. JUNGHEER (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 1, pp. 64-75, figs. 9).—During the examination at the [Connecticut] Storrs Experiment Station "of placental tissues from three cases of spontaneous abortion and one case of abnormal epithelial thickenings in the amnion in herds free from Bang's abortion disease, mycotic infections were demonstrated by cultural or histologic means. In one animal evidence of mycotic infection was obtained on the occasion of two abortions which occurred 2 yr. apart. A correlation of the breeding data and laboratory findings signifies the etiologic importance of such infections. The organisms implicated in these cases resembled *Aspergillus fumigatus*, *A. niger*, *Rhizopus cohnii*, and *Mucor pusillus*. Mycotic affections of the pregnant uterus seem to be of intrinsic importance with regard to the individual sexual health of the animal, but of only slight importance from the epizootic standpoint in the herd." It is concluded that "cases of abortions of unknown etiology should be made the subject of laboratory analysis as a part of the general program of combating Bang's disease and of other diseases of the genital tract which are of economic importance."

Length of incubation period in infectious abortion in cattle: The time between the infection and the abortion [trans. title], S. WALL (*Skand. Vet. Tidskr.*, 24 (1934), No. 8, pp. 453-484; *Eng. abs.*, p. 484).—The author has found that the incubation period of infectious abortion in cattle varies between very wide limits, sometimes being as short as 11 days and at other times being as long as 189 days. In from 33 to 42 percent of the cases the incubation period lies between 31 and 60 days; not infrequently, or in from 13 to 26 percent of the cases, within a month after infection. In from 41 to 47 percent of the cases the incubation is longer than 2 mo. The percentage of cases with the longer incubation period diminishes as follows: 91 to 120 days, 17 or 18 percent; 121 to 150 days, 5 or 7 percent; and 151 to 180 days, 2 or 7 percent, with only 3 percent of the cases exceeding 181 days.

Mastitis studies (*New York State Sta. Rpt.* 1934, pp. 18-20).—A brief statement is made of the progress of work with mastitis, with particular reference to its detection (E. S. R., 72, p. 386) and methods of control.

The most practical field and laboratory tests for detection of mastitis, J. M. ROSELL (*Sci. Agr.*, 15 (1934), No. 3, pp. 169-175).—This contribution supplements the accounts previously noted (E. S. R., 72, p. 250).

Blackleg in cattle, H. WELCH (*Montana Sta. Circ.* 144 (1934), pp. 7, figs. 4).—A practical summary of information.

Trichomonas infection in cattle: A survey [trans. title], B. H. JENSEN (*Skand. Vet. Tidskr.*, 24 (1934), No. 11, pp. 649-660; *Eng. abs.*, pp. 659, 660).—A review is given of the present status of knowledge of *Trichomonas* infection in cattle, which has not as yet been observed in Scandinavia. It appears to be confined to southern Europe, inclusive of the south of Germany, with isolated cases of the disease occurring in America in animals imported from Europe.

A note on bovine trypanosomiasis in Hyderabad State, M. R. MAHAJAN (*Indian Jour. Vet. Sci. and Anim. Husb.*, 4 (1934), No. 3, pp. 242-246, pl. 1).—This contribution relates to the occurrence of bovine trypanosomiasis due to an undetermined species of *Trypanosoma* in the Asifabad district of Hyderabad, recorded for the first time in November 1932. The attacks are said to have been so acute that the outbreaks were mistaken for anthrax.

The precipitin test as a means of diagnosis of tuberculosis in cattle, J. McCARTER, W. WISNICKY, and E. G. HASTINGS (*Amer. Rev. Tuberc.*, 30 (1934), No. 5, pp. 584-587).—In work at the Wisconsin Experiment Station the precipitin test was found to be of no value as a supplement to the tuberculin test in reducing the ratio of no-lesion animals to the total number of reacting cattle.

Calf diphtheria (*Wyoming Sta. Rpt.* 1934, p. 24).—Brief reference is made to studies in the course of which *Actinomyces necrophorus* was isolated.

Further studies of diseases affecting moose, R. FENSTERMACHER (*Minnesota Sta. Bul.* 308 (1934), pp. 26, figs. 4).—In continuation of the studies previously noted (*E. S. R.*, 69, p. 431) the author reports upon investigations of seven animals from which material was available for examination, the data being presented under the headings of symptomatology, necropsy findings, blood studies, serological findings, bacteriological findings, experimental animal inoculations, and winter tick attachment experiments including blood studies of tick-infested experimental animals, and histopathological examination.

Opportunity was afforded to observe five sick moose and afterward to conduct autopsies upon these animals. A list is given of 11 animal parasites collected from the moose. The studies have led to the conclusion that occasionally moose die as a result of mechanical injury, as was the case with one of the seven animals studied. Thus far the attempt to transmit any disease in laboratory animals by means of ticks engorged on diseased moose have given negative results. Despite the evidence presented by others, the author concludes that the losses of moose in Minnesota are not the result of a single pathogen; that the conditions studied are brought about through factors cooperating to reduce the vitality of the moose.

A list is given of 14 references to the literature.

Diseases affecting moose, R. FENSTERMACHER (*Vet. Alumni Quart. [Ohio State Univ.]*, 22 (1934), No. 3, pp. 81-94, figs. 3).—This contribution is based upon work conducted at the Minnesota Experiment Station as reported in Bulletin 294 (*E. S. R.*, 69, p. 431) and Bulletin 308 (above noted).

Gonacrine in the treatment of ovine babesiellasis and ovine nuttalliasis [trans. title], H. VELU and G. ZOTTNER (*Bul. Soc. Path. Exot.*, 27 (1934), No. 9, pp. 835-839).—The authors find gonacrine to be a specific medicament in the treatment of the true piroplasmoses, babesiellases, and nuttalliasis, and by reason of its polyvalence it should replace trypan blue, ichthargan, and piroblue in the pharmacopoeia.

Pulpy kidney disease (entero-toxaemia) of sheep in Palestine, S. J. GILBERT (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 4, pp. 255-258).—The experiments here reported show pulpy kidney disease (enterotoxaemia) of sheep to occur on the plain of Esdraelon in Palestine, and that it is probably common to all sheep in that area at least. Microscopic examination of a piece of spleen from a dead sheep revealed the presence of large numbers of bacilli morphologically identical with *Bacillus welchii*.

The epidemiology of winter outbreaks of parasitic gastritis in sheep, with special reference to outbreaks which occurred during the winter of 1933-34, E. L. TAYLOR (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 4, pp. 235-254).—The report here presented (*E. S. R.*, 71, pp. 701, 847; 72, p. 103) relates to an epidemic of parasitic gastritis which caused severe losses during the winter of 1933-34. It was principally associated with heavy infestations of *Trichostrongylus* spp. Species of *Ostertagia* are said to have been numerous in some instances. *Haemonchus* and *Nematodirus* do not appear to have been involved, rarely being represented at all and then only in small numbers.

Control of stomachworms and lungworms of sheep (*West Virginia Sta. Bul.* 263 (1934), p. 31).—Brief reference is made to intestinal parasite control work with affected sheep (E. S. R., 68, p. 811) through drenching at 21-day intervals with a 1.5 percent solution of copper sulfate, also mass feeding with copper sulfate and salt, and to lungworm control by systematic treatment with an oily preparation of pyrethrum.

Crotalaria spectabilis Roth seed poisoning in swine, M. W. EMMEL, D. A. SANDERS, and W. W. HENLEY (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 1, pp. 43-54, figs. 4).—In experimental work at the Florida Experiment Station here reported, "ground *C. spectabilis* Roth seed were fed to 5 hogs in 2-g daily doses and to 10 hogs in 0.5-g daily doses, with fatal results in most cases. Whole seed of *C. spectabilis* administered in capsules passed undigested through the alimentary tract of experiment animals. The outstanding gross lesions of *C. spectabilis* poisoning in swine were severe anemia, accumulations of fluid in the abdominal and thoracic cavities, ecchymoses of the endocardium, and gastritis, death often being caused by gastric hemorrhage. The most pronounced microscopic lesions were passive congestion, cloudy swelling of all the parenchymatous organs, heart muscle and smooth muscle of the viscera, edema, and focuses of necrosis in the lymph nodes and parenchymatous organs."

Further investigations respecting the types of bacilli in tuberculosis in swine [trans. title], H. HOLTH (*Norsk Vet. Tidsskr.*, 46 (1934), No. 12, pp. 589-624; *Eng., Ger. abs.*, pp. 623, 624).—The types of the tubercle bacillus found in tuberculosis of swine were determined through direct inoculation into rabbits and guinea pigs. Lymph glands with macroscopically evident tuberculosis from 55 swine that were examined resulted in the detection of 3 cases of the human type and 45 cases of the avian type.

Controlling kidney worms in swine in the Southern States, B. SCHWARTZ (*U. S. Dept. Agr. Leaflet* 108 (1934), pp. 6, figs. 4).—In this brief practical account, which includes a figure illustrating the life history of the swine kidney worm and also a plan of a hog pasture with a special arrangement for feeding sows and young pigs to prevent infestation of young pigs with kidney worms, the author considers special management as a control measure, emphasizing the importance of feeding sows separately and the value of the system as shown by post-mortem results.

Development of the swine nematode *Strongyloides ransomi* and the behavior of its infective larvae, J. T. LUCKER (*U. S. Dept. Agr., Tech. Bul.* 437 (1934), pp. 31, figs. 5).—A report is given of a study of the life cycle and behavior of infective larvae of *S. ransomi*, a species of common occurrence in pigs in the United States, conducted with a view to discovering facts which might be of value in connection with its control and supplementing the observations of Schwartz and Alicata (E. S. R., 62, p. 670). The work reported includes the preparasitic development of *S. ransomi*, paths of entry of infective larvae into the host, development in normal and other hosts, a discussion of preparasitic and parasitic development, effects of environmental factors on viability of eggs and survival of larvae, reactions of infective larvae to stimuli and environment, clinical symptoms of pathogenicity, and suggestions for the control of the parasite. The measures suggested for the control of *S. ransomi* infestation in pigs include thorough sanitation and the selection of a dry, unshaded area as a permanent lot.

A list is given of 27 references to the literature.

Mosquito transmission of equine encephalomyelitis, M. H. MERRILL, C. W. LACAILLADE, JR., and C. TEN BROECK (*Science*, 80 (1934), No. 2072, pp. 251, 252).—The authors report that in repeated tests they have demonstrated that

the saltmarsh mosquito, which makes up 90 percent of those trapped in the affected area in New Jersey and Delaware, will transmit both the eastern and western strains of equine encephalomyelitis on the seventh and following days. It has transmitted the eastern disease from infected to normal guinea pigs 11 days after the initial feeding and at later periods. "When these mosquitoes fed on an infected horse the first transmission occurred after 20 days, there having been no transmission at 14 days. Twelve other mosquitoes of this lot, which were allowed to feed upon a normal horse at the 30-day period, failed to infect it. Seven of these same mosquitoes transmitted the disease to a guinea pig 3 days later. Although this one attempt to obtain horse-to-horse transmission was negative, we believe that the evidence is sufficient to establish *Aedes sollicitans* as a probable vector of equine encephalomyelitis in the Eastern States."

Of the three remaining saltmarsh mosquitoes (the brown saltmarsh mosquito, *A. taeniorhynchus*, and *Culex salinarius*), a few tests with the brown saltmarsh mosquito indicate that it will transmit the eastern virus but less readily than the saltmarsh mosquito. *A. taeniorhynchus* is being tested, while *C. salinarius* has not been secured in sufficient numbers for test. The more widely distributed mosquitoes, *C. pipiens* and *Anopheles quadrimaculatus*, have uniformly failed to transmit either the eastern or western strains of virus.

"In parallel experiments in which the mosquitoes have been allowed to feed on brain virus suspension we have consistently obtained transmission of western but not of eastern virus by [the yellow-fever mosquito] *A. aegypti*. In occasional instances, however, this mosquito has transmitted eastern virus from infected to normal guinea pigs, whereas in parallel experiments with western virus transmission has been uniformly obtained.

"Our experiments show that when either *A. aegypti* or *A. sollicitans* are fed on guinea pigs with a low virus content in their blood, the virus is soon lost and the mosquitoes do not transmit the disease. In order to act as vectors mosquitoes must be fed on infected animals at a time when the virus content of the blood is such that 0.0001 cc or less will produce the disease when it is injected into a guinea pig. Such a blood titer appears in general to be reached at the height of the first febrile reaction and before any central nervous system symptoms become manifest. It is not clear why this high virus content of the infective meal is necessary, since titration experiments with ground suspensions of mosquitoes indicate that there is an increase of virus in the mosquito. In both *A. aegypti* infected with western virus and *A. sollicitans* infected with the eastern virus a 1,000 to 10,000 fold increase of the virus within the mosquitoes has been demonstrated."

The virus persists in at least some of the mosquitoes as long as they live. The eastern virus was transmitted by the saltmarsh mosquito 33 days after an infective meal, the longest period the authors were able to keep a sufficient number alive for test. The longest period the yellow-fever mosquito was found capable of transmitting the disease was 63 days. The virus was shown to be present in this same lot of mosquitoes 93 days after feeding, but they did not transmit the disease at that time.

Some methods of controlling the spreading of internal parasites of the horse, I. W. PARNELL (*Sci. Agr.*, 15 (1934), No. 3, pp. 165-168).—This is a brief discussion of methods of controlling the spread of internal parasites of the horse in the stable and farmyard and in the field by physical and chemical agencies.

Experimental treatment of wounds of the horse with larvae and larval extracts of *Lucilia sericata* [trans. title], VECTEN and COSSON (*Bul. Acad. Vét.*

France, 7 (1934), No. 8, pp. 352-357).—The employment of maggots of *L. sericata* in the treatment of wounds of the horse has resulted in prompt improvement where the use of antiseptics has failed. The local amelioration has resulted in a general improvement of the subject.

Rabies: Its history in Nevada, E. RECORDS (*Calif. and West. Med.*, 37 (1932), No. 2, pp. 90-94).—Contributing from the Nevada Experiment Station, the author reports that so far as known the far West was free from rabies until 1909. At that time it made its appearance in southern California, whence it was introduced into Oregon in 1912 by a sheep dog taken from Redding to Wallowa County, and where in a fight a coyote was infected. From Oregon it spread southeast into Idaho, Nevada, and Utah, reaching Nevada in April 1915. Once introduced into the northern part of the State, the disease was spread by means of wild animals and other factors beyond control southward until every county in the State was affected to a greater or less extent. The occurrence of the disease in the State, the predatory animal problem, and control work conducted are reported upon. A table is given showing the results of the activities of the U. S. D. A. Bureau of Biological Survey and the Nevada State Rabies Commission, cooperating. The rabies situation in the State is still somewhat complicated by the fact that to a certain extent the still existent predatory animal population serves as a reservoir from which the dog population of various communities is periodically reinfected.

The relationship of parasitism to the poultry industry, A. B. WICKWARE (*Sci. Agr.*, 15 (1934), No. 3, pp. 178-180).—A contribution from the poultry pathology laboratory maintained in Canada by the Health of Animals and Dominion Experimental Farm Branches cooperatively.

A new nematode parasite of Gallus domesticus L. in Brazil: Capillaria bursata n. sp. [trans. title], J. F. TEIXEIRA DE FREITAS and J. LINS DE ALMEIDA (*Mem. Inst. Oswaldo Cruz*, 28 (1934), No. 2, pp. 273-275, pls. 2).—A nematode parasite taken from the small intestine of the domestic fowl at Rio de Janeiro is described as new under the name *C. bursata*.

A study on "cell-inclusion disease" in fowls, I, II, A. KOMAROV (*Jour. Compar. Path. and Ther.*, 47 (1934), No. 4, pp. 282-295, figs. 2; 296-301, figs. 8).—This contribution is presented in two parts.

I. *On the identity of acute cell-inclusion disease and fowl-plague*.—The experimental data presented show that the virus isolated from cases of acute cell inclusion disease during an outbreak in Petach-Tikva, Palestine, produces in fowls a disease which is similar in every respect to that produced by known fowl plague virus. Furthermore, serum obtained from birds immunized against the Petach-Tikva virus neutralizes known fowl plague virus, and birds immune to the Petach-Tikva disease were found to be immune to fowl plague. The results indicate that the two viruses are identical.

II. *On the diagnostic value of the "chromatic-inclusions" in the leucocytes*.—The observations reported indicate that chromatic inclusions identical with those described by Adler (*E. S. R.*, 53, p. 386) are found in a variety of infections. The leucocytic cell inclusions were regularly encountered in birds shown to be infected with spirochetosis. Attempts to demonstrate a specific virus in birds suffering from a so-called "chronic cell inclusion disease" gave negative results.

The size of the virus of fowl plague estimated by the method of ultrafiltration analysis, W. J. ELFORD and C. TODD (*Brit. Jour. Expt. Path.*, 14 (1933), No. 4, pp. 240-246).—In work at the National Institute for Medical Research, London, "the size of the elementary virus particles of fowl plague as they exist in the body fluids of the fowl has been estimated by ultrafiltration

analysis, using graded collodion membranes, to be 60 to 90 μ . Control experiments in which *Staphylococcus* K bacteriophage (size 50 to 75 μ) was admixed with the virus suspension confirmed the close relationship in size between this phage and the virus. Differentiation of their filtrabilities was only just possible."

Observations upon neuritis in fowls (so-called fowl paralysis): A quick method of diagnosis by means of nerve smear preparations, K. D. DOWNHAM and C. CROMPTON (*Vet. Jour.*, 90 (1934), No. 12, pp. 505-507).—The authors have devised a way by which fowl parasites can be diagnosed by means of histological preparations said to be simpler and more satisfactory than the generally accepted method. "A portion of the nerve which is to be examined is carefully dissected away and cut across in two places by means of a sharp scalpel. If it is thought necessary, owing to the presence of blood, to wash in normal saline solution, a fresh surface should be cut before making the preparation. The cut surface is smeared on a slide, gentle pressure being exerted on the nerve by means of pincer forceps. The preparation is then stained by Leishmann's method and examined. The infiltrating cells which have been exuded from the nerve sheaths show up excellently, and a diagnosis may be given at once. It is unusual to find more than one or two red cells present among the large number of infiltrated leucocytes, even if no special precautions are taken in the preparation of the smear."

Differentiation of *Salmonella pullorum* and *S. gallinarum* [trans. title], LÉSEBOUYRIES (*Bul. Acad. Vét. France*, 7 (1934), No. 6, pp. 272, 273).—The author has found the fermentation of maltose by *S. gallinarum* in less than 24 hr. and the failure of *S. pullorum*, both types A and B, to do so even after many days to be a means for differentiating these two pathogens.

Paratyphoid in ducks [trans. title], J. JANSEN (*Tijdschr. Diergeneesk.*, 61 (1934), No. 23, pp. 1247-1254, 1255; *Ger., Eng., Fr. abs.*, pp. 1254, 1255).—In a study of 8 ducks suffering from oöphoritis and 1 dead duckling, paratyphoid bacteria were isolated. Seven of these were found to represent *Bacterium enteritidis* of Gaertner and 2 *B. enteritidis* of Breslau.

Serological study of pigeon paratyphoid in Egypt, I. A. B. KHALIFA (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 1, pp. 24-27).—In this contribution a report is given of the cultural and biochemical reactions of the pigeon paratyphoid organism that was isolated during an epidemic at Cairo in 1930. It agglutinated *Bacillus aertrycke* up to 1:10,240, *B. paratyphosus* B up to 1:2,560, and *B. paratyphosus* C up to 1:5,120. Observations of its pathogenicity for several laboratory animals are recorded.

Trichomoniasis in the pigeon.—V, Mouth and throat trichomoniasis (flagellate diphtheria) [trans. title], A. BOS (*Tijdschr. Diergeneesk.*, 61 (1934), No. 21, pp. 1125-1139, pl. 1; *Ger., Eng., Fr. abs.*, pp. 1138, 1139).—Trichomonads were regularly encountered and cultivated in pure culture from pigeons suffering from diphtheritic infections characterized by fibrinous inflammations and necrosis in the mouth, throat, larynx, esophagus and surrounding muscular tissue, and sometimes in the trachea. Morphologically no difference was seen with the *Trichomonas* formerly determined as being responsible for foci of the liver. With material from foci of the liver and with pure cultures of liver trichomonads, the typical diphtheritic symptoms and reactions of the skin could also be produced. The occurrence of diphtheria due to pigeon pox virus may be possible; mixed infections of pox virus and trichomonads were encountered. In turkeys with pigeon trichomonads, trichomoniasis of the mouth and jaw and infection of the liver and ventriculus could be experimentally produced.

Experiments with fowl pest [trans. title], L. BALOZET (*Arch. Inst. Pasteur Tunis*, 23 (1934), No. 1, pp. 49-52).—It is pointed out that the pigeon is refractory to fowl pest under natural conditions, only one instance of spontaneous infection having been reported. Experimentally the pigeon has been found very resistant to subcutaneous and intramuscular inoculations, but the resistance may be overcome (1) through inoculation of a virus that has been exalted by successive passages in the fowl, (2) by intracranial inoculation, or (3) through inoculation of young birds. In the present account the author reports particularly upon the results of successive brain passages in the pigeon and rabbit.

Great horned owls dying in the wild from diseases, P. L. ERRINGTON (*Wilson Bul.*, 44 (1932), No. 3, p. 180).—This contribution from the Wisconsin Experiment Station refers briefly to the finding of an undetermined virus to be the cause of death of several great horned owls near Prairie du Sac. An examination by R. G. Green, of the University of Minnesota, led to the elimination of tularemia as the cause of death.

Flat-worm and round-worm parasites of wild rabbits of the northern panhandle, B. R. WEIMER, R. S. HEDDEN, and K. COWDERY (*W. Va. Univ. Bul.*, 34, ser., No. 15 (1934), pp. 54, 55).—In a study of 25 rabbits obtained from hunters in West Virginia during the regular fall hunting season 5 different species of roundworms and flatworms were found in the alimentary tract and adjacent tissues, namely, the American stomach worm *Obeliscoides cuniculi* in 44 percent, the intestinal tapeworm *Cittotaenia ctenoides* in 89 percent, the rabbit whipworm *Trichuris leporis* in 36 percent, the pinworm *Passalurus ambiguus* in 28 percent, and the bladder worm *Taenia pisiformis* in 60 percent.

AGRICULTURAL ENGINEERING

International directory of agricultural engineering institutions, A. BRIZI (*Les Institutions de génie rural dans le monde. Roma: Inst. Internatl. Agr.*, 1934, 4. ed., pp. [7]+185).—This is the fourth edition of this directory (E. S. R., 68, p. 98). It covers practically the entire civilized world.

System of classification for agricultural engineering material, S. VON FRAUENDORFER (*[Internatl. Rev. Agr.]*, *Mo. Bul. Agr. Sci. and Pract.* [Roma], 25 (1934), No. 9, pp. 393-411).—A classification system of agricultural engineering is presented which is part of a wider and more complex system, embracing all branches of agriculture. The system is intended to form a basis for a bibliography of agriculture which is to include a systematic subdivision, not only of technical literature but also the contents of periodicals.

Report of the Chief of the Bureau of Agricultural Engineering, 1934, S. H. McCrory (*U. S. Dept. Agr., Bur. Agr. Engin. Rpt.*, 1934, pp. 23).—The progress results are presented of studies as to the consumptive use of water in irrigation, the underground storage of water, the use of a portable overhead spray line for irrigation in humid regions, sewage irrigation, losses of head in bends of 6-in. pipes, drainage of sugarcane lands, control of ground water in peat and muck soils, soil erosion control, farm development, farm structures, greenhouse heating, potato storage, mechanical coolers for milk and improved machinery for corn, cotton, and sugar beet production, insect control, fertilizer placement, resistance of bolts to corrosion, drying of forage crops, seed scarifiers and cleaners, and cotton ginning. The great part of this research program was conducted in cooperation with the different State agricultural experiment stations.

[Agricultural engineering investigations at the California Station] (*California Sta. [Bien.] Rpt. 1933-34, pp. 16-18, 95-103*).—A brief description of the soil erosion investigations of the station is given, together with notes on dairy structures, threshing injury to seed peas, butane for use in gas engines, a hill-drop sugar beet planter, walnut-spraying machinery, use of electricity in farming, and portable sprinklers for irrigation.

[Soil erosion and farm housing investigations] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1934, pp. 101, 102, 103-105*).—Tests at the erosion experiment farms on terracing, supplemented by contour plowing and the use of soil-saving and soil-building crops, as the most effective means of controlling soil erosion on cultivated land, and data from the farm housing survey conducted in cooperation with the agricultural colleges and experiment stations in 46 States are briefly noted.

Groundwater.—I, Fundamental principles governing its physical control, W. GARDNER, T. R. COLLIER, and D. FARR (*Utah Sta. Bul. 252 (1934), pp. 40, figs. 23*).—This bulletin discusses fundamental principles governing the physical control of ground water and indicates applications. The mathematical background required in the presentation of the principles of the movement of ground water is presented in considerable detail.

It is shown that Newton's second law of motion, together with elementary hypotheses concerning frictional forces resisting the flow of water through soils, leads to Darcy's experimental velocity law generalized for flow in three dimensions. Applications are made to the solution of practical problems in the design of drainage structures, flow into wells, watershed erosion, leakage from canals, subirrigation, etc. A modified approximation form of Darcy's law is presented for the solution of problems in capillary flow.

Vertical drainage, H. E. BESLEY (*New Jersey Stat. Circ. 336 (1934), pp. 4, figs. 5*).—Brief practical information is given on the installation and operation of vertical drains constructed by either boring or blasting.

Latest results of engineering experiments at the soil erosion experiment stations, C. E. RAMSER (*U. S. Dept. Agr., Bur. Agr. Engin., 1934, pp. 11*).—This is a brief mimeographed contribution in which the progress results of the engineering experiments in progress at the soil erosion experiment stations, conducted mainly in cooperation with several State agricultural experiment stations, are presented.

It is pointed out that experiments designed to improve the practice of terracing constitute the major part of the investigations. A summary of the results indicates that terraces should be spaced close enough to prevent the concentration of water and appreciable erosion on the land slope between terraces. Also, the ability of the terrace channel to carry away the run-off water delivered to it during rains of high intensity should be considered.

The data indicate that the control of erosion in the terrace channel can be accomplished to a limited extent by the shape of the channel. The height of the terrace also largely determines the cross-sectional area of the waterway for any particular slope.

Erosion control structures—drop inlets and spillways, L. H. KESSLER (*Wisconsin Sta. Res. Bul. 122 (1934), pp. 66, figs. 37*).—This bulletin presents the results of an analysis of the hydraulic characteristics of certain types of concrete conduits, flumes, and spillways used with earth-filled, soil-saving dams for erosion control. It was prepared by the Agricultural Experiment Station and the Engineering Experiment Station of the University of Wisconsin in cooperation with the U. S. D. A. Forest Service and the Wisconsin Civil Works Administration.

The structures analyzed included drop inlets, notch spillway, head flume, and head spillway. A large amount of engineering information is presented but not in form for brief presentation.

Terracing in Alabama, A. CARNES and J. B. WILSON (*Ala. Polytech. Inst. Ext. Circ. 148* (1934), pp. 20, figs. 12).—Practical information is presented on useful terracing practices adapted to Alabama soil conditions. It is based on the results of studies conducted at the Alabama Experiment Station. The methods of erosion control combine the use of terraces and vegetation as strip crops.

It has been found that the so-called Nichols terrace is the most satisfactory for Alabama conditions. It consists essentially of a broad, shallow ditch, with a moderate sized mound on the lower side. Since this terrace carries most of the water below the surface of the ground, complete failures rarely occur.

Terracing in a land use program, S. P. LYLE (*U. S. Dept. Agr., Bur. Agr. Engin., 1934*, pp. 5).—In this brief mimeographed contribution, the importance of terracing in connection with the development of a sound land-use program is presented.

Civil engineering handbook, edited by L. C. URQUHART (*New York and London: McGraw-Hill Book Co., 1934*, pp. VIII+885, figs. [586]).—This handbook contains 10 sections. Of special interest to agricultural engineers are those on surveying, mechanics of materials, hydraulics, stresses in framed structures, steel design, concrete, foundations, sewerage and sewage disposal, and water supply and purification.

A. S. T. M. tentative standards, 1934 (*Philadelphia: Amer. Soc. Testing Materials, 1934*, pp. XXVIII+1257, pl. 1, figs. [191]).—This number of this book contains 236 tentative specifications, methods of testing, definitions of terms, and recommended practices covering materials of engineering and the allied testing fields. Of these 236 tentative standards, 25 relate to ferrous metals, 25 to nonferrous metals, 48 apply to cementitious, ceramic, concrete, and masonry materials, and 127 cover miscellaneous materials such as paints, petroleum, insulation, textiles, etc., while 11 are general testing methods applying to these materials.

The protection of jointed wood products against decay and stain, E. E. HUBERT (*Idaho Univ. School Forestry Bul. 4* (1934), pp. 36, figs. 10).—Studies are reported the purpose of which was to develop methods of protecting wood joints against decay and stain.

It was found that the number of actual failures of wood joints which are traceable to decay and stain are small and the losses are greatly exaggerated. The tests included laboratory tests, rot cellar tests, and laboratory paint tests. The results point to the use of any one of three types of protective measures, including (1) a toxic, penetrating chemical compound applied to a part of or to the entire product or inserted in a shallow cup in the tenon of the joint, (2) a water-repellent compound possessing high penetrating qualities applied as in 1, and (3) an effective combination of 1 and 2. The 10 compounds found most effective in the laboratory and rot cellar tests are listed.

Research on metals and alloys, F. C. FRARY (*Indus. and Engin. Chem., 26* (1934), No. 8, pp. 281-284).—A summary of data is presented on the effect of impurities in metals, workability, problems of melting metals, customers' problems, casting processes, and corrosion problems.

It is pointed out that there are two fundamental objectives in research on metals and alloys. The first involves the investigation of the complex physicochemical intermetallic systems and the effects of variations in temperature, minor impurities, and other variables upon such systems. The

second objective comprises the improvement of available alloys and metals to make them more widely adaptable or useful and the discovery of possible new and useful alloys. Experience shows that the second of these objectives cannot be pursued to the best advantage without a simultaneous pursuit of the first.

Permeability tests of 8-in. brick wallettes, L. A. PALMER and D. A. PARSONS (*Amer. Soc. Testing Materials, Preprint 57 (1934), pp. 13, figs. 3*).—A total of 240 wallettes made with 10 representative mortars and 5 makes of bricks were aged for 3 mo. and tested for permeability by keeping a constant level of water in a shallow reservoir (1 in. in depth) on the upper surface (face) of each test specimen. Each wallette was constructed with 16 bricks (both header and stretcher bricks), and the mortar joints were approximately $\frac{1}{2}$ in. in thickness. The most watertight walls were obtained with smooth impervious bricks set dry and smooth porous bricks set wet (15 min. total immersion). The degree of watertightness of the wallettes was also dependent on the working properties of the mortars.

Columbia manual of concrete curing (Barberton, Ohio: Columbia Alkali Corp., 1934, pp. 55, figs. 19).—This is a handbook of information on the curing of concrete.

Analysis of a rigid frame concrete arch bridge, C. D. GEISLER (*U. S. Dept. Agr., Misc. Pub. 184 (1934), pp. II+16, figs. 8*).—This is a complex mathematical and structural analysis.

Photoelastic determination of temperature stresses in an arch bridge model, Z. LEVINTON (*Engin. Jour., 17 (1934), No. 12, pp. 513-517, figs. 9*).—After a brief account of the photoelastic method of determining stress by polarized light, this paper describes a series of tests on a bakelite model of an arch of a bridge made to ascertain the stresses in the arch ribs and columns due to change of temperature. The experiments were conducted at the University of Saskatchewan.

It was found that the inherent error of the photoelastic method is the inaccuracy in determining the stress values of the isochromatics. This error may easily reach 5 percent, and where initial stresses are present is doubled. The error due to variation of optical effect with time after application of the load was found to be negligible at low stresses. On the other hand, the total error in determining the temperature stresses in the short columns was probably less than 20 percent.

Welded joints studied with new type polariscope (*Engin. News-Rec., 113 (1934), No. 20, pp. 621, 622, fig. 1*).—A new type of polariscope developed in the photoelastic laboratory of Columbia University is briefly described which makes possible photoelastic studies of problems involving two parallel systems of plane stress, as represented by the stress distribution in the overlapping plates of side-welded connections.

Public Roads, [December 1934] (*U. S. Dept. Agr., Public Roads, 15 (1934), No. 10, pp. 237-252+[2], figs. 9*).—This number of this periodical contains the current status of U. S. Public Works road construction as of November 30, 1934, and the following articles: Soil Tests Useful in Determining Quality of Caliche, by H. S. Gillette (pp. 237-242); Traffic on State and County Roads of Indiana (pp. 243-247, 250); and Effect of Temperature and Moisture Content on the Flexural Strength of Portland Cement Mortar, by D. O. Woolf and K. F. Shippey (pp. 248-250).

Report on C. W. A. national survey of rural electrification, G. W. KABLE and R. B. GRAY (*U. S. Dept. Agr., Bur. Agr. Engin., [1934], pp. 68, figs. 3*).—

This mimeographed contribution describes a survey undertaken as a supplement to the C. W. A. Farm Housing Survey. The purpose of the survey was to obtain information relative to the present availability of electric service to farmers, its use, and the possibility of extending service to additional farms. Twenty-five States were included in the survey. Data are also given as to rural developments in foreign countries.

Thermal decomposition of hydrocarbons and engine detonation, F. O. RICE (*Indus. and Engin. Chem.*, 26 (1934), No. 8, pp. 259-262, fig. 1).—The results of studies conducted at Johns Hopkins University are reported which indicated that the thermal decomposition of the fuel probably plays an appreciable role in the reactions occurring in the internal-combustion engine. This decomposition results in one molecule of the fuel being replaced by several molecules. This increase in concentration may greatly augment the rate of oxidation. Different hydrocarbons yield different numbers of molecules of products per mole decomposed, and calculation shows a strict parallelism between this and the knocking tendency. The knocking tendency increases with an increase of the number of moles of product per mole decomposed. One effect of antiknock compounds is to reduce the number of moles of products formed from the decomposition of one mole of hydrocarbon.

Knocking characteristics of hydrocarbons, W. G. LOVELL, J. M. CAMPBELL, and T. A. BOYD (*Indus. and Engin. Chem.*, 26 (1934), No. 33, pp. 1105-1108, figs. 4).—This paper presents data on the knocking characteristics of 103 hydrocarbons, including paraffin, naphthene, and aromatic compounds. The measurements were made in the pure state and are expressed in terms of engine compression ratio at incipient knock under definite conditions of engine operation. Such critical compression ratios vary over a range of about 14 ratios. The qualitative general correlations between knocking characteristics and molecular structure previously found for such hydrocarbons when measured in dilute solutions were found to hold in general, with some notable exceptions. These arose from the fact that the compression ratio of a mixture of two compounds is not always directly proportional to concentration.

Tests show merits of butane as an internal combustion engine fuel, C. J. VOGT (*Automotive Indus., Auto.*, 71 (1934), No. 12, pp. 348-351, figs. 8).—The results of studies conducted at the University of California are reported which involved a program of study on engine operating characteristics with various hydrocarbon fuels.

It was found that the brake mean effective pressure at 1,000 r. p. m. was much higher for butane-air mixtures than for gasoline-air mixtures. Maximum brake mean effective pressure was found to occur nearer the theoretical air-to-fuel ratio for complete combustion when using butane than when using gasoline, indicating a more homogeneous mixture for butane and air than for gasoline and air.

Although the brake mean effective pressure was higher for butane-air mixtures, the economy was less than for gasoline, especially at the higher compression ratios. However, it is pointed out that at the present price of butane this fuel has a great advantage over gasoline on the basis of fuel cost.

Spark adjustment for best performance was found to be practically the same with butane and gasoline.

Lubricating oils from ethylene, R. G. ATKINSON and H. H. STORCH (*Indus. and Engin. Chem.*, 26 (1934), No. 33, pp. 1120-1122, figs. 3).—Studies conducted by the U. S. Bureau of Mines are reported which indicate the possibility of producing a good light lubricant from the lower members of the olefin series

by a 2-stage process, the first step being a thermal polymerization to a liquid boiling in the gasoline range. The material produced in this manner can then be polymerized by aluminum chloride to a viscous liquid suitable for a lubricant.

Friction tests on lubricating oils, J. W. DONALDSON and D. R. HUTCHINSON (*Jour. Soc. Chem. Indus., Trans.*, 52 (1933), No. 49, pp. 424-429, figs. 9).—The results of studies are reported the purpose of which was to ascertain if an extremely simple mechanical arrangement could be devised which would give discriminating results with oils of comparative specifications.

The apparatus used for testing consists essentially of a ball resting in a spherical seat. The ball is attached to a weight at the end of a rod so that the whole forms a pendulum which can be oscillated on the fixed spherical seat. The pendulum is swung through a definite angle by means of a releasing gear at the lower end, and on a scale supported above the seat the angle of swing of the pendulum is determined. Two drops of oil are sufficient to lubricate the surface between the ball and seat. To determine changes taking place in the properties of the oil on heating, the seat is converted into an electric heating unit.

The results obtained with animal, vegetable, and mineral oils were in general agreement with those of other investigators as regards the behavior of fixed and mineral oils under conditions of boundary lubrication. It was found that the behavior of mineral oils, whereby their coefficient of friction increases as the viscosity decreases on heating, may possibly be attributed to the increasing number of asperities in the bearing which would be brought into contact by the lowering of the viscosity. In this connection it is suggested that the asperities are of molecular proportion.

The decrease in the coefficient of friction at high temperatures of the fixed oils suggests a chemical change whereby a new chemical state occurs at the points of approach. The persistence of a lubricating film at very high loads leads to the supposition that an adsorption film operates on the surface.

In the various bearings dealt with, frictional resistance appears to be due to two factors, namely, an increased frictional rate due to decreasing viscosity on heating and an increasing adsorption rate depending on the nature of the oil. In mineral oils the rates might equalize at high temperatures to give a constant coefficient of friction, and in fixed oils with a high adsorption rate such an adsorption rate might be greater than the increased frictional rate, due to decreasing viscosity, and lead to a decrease in the coefficient of friction.

French motor tillage demonstration (*Impl. and Mach. Rev.*, 60 (1934), No. 715, pp. 584-587, figs. 3).—A brief account is given of the annual demonstration of motor tillage machines organized by the *Chambre Syndicale de la Motoculture* and the Ministry of Agriculture.

Growing potatoes with tractor power, R. U. BLASINGAME (*Amer. Potato Jour.*, 11 (1934), No. 8, pp. 199-204, figs. 2).—The results of experiments conducted at the Pennsylvania Experiment Station on the growing of potatoes with tractor power are reported. The data presented relate to seed bed preparation, fertilizer distribution, planting, foliage protection, weeding and cultivating, and harvesting, and information also is presented on the machinery developments found necessary and on the power and labor requirements.

Relation of digger operation to potato tuber injury, E. V. HARDENBURG (*Amer. Potato Jour.*, 11 (1934), No. 7, pp. 171-176).—The results of studies conducted by the [New York] Cornell Experiment Station are reported in which it was found that about 10 percent of the potato crop grown in New York in 1931 and 1932 was mechanically injured by the digger.

It was found that the standard makes of diggers in common use appeared to be equally efficient in respect to tuber injury. About 85 percent of the elevator diggers used in New York in 1931 and 1932 were equipped with rear attachments. The other 15 percent, equipped with a continuous apron, resulted in 35 percent less bruising of the tubers. On 88 diggers equipped with rear attachment, the drop from front to rear attachment ranged from 11 to 18 in. For each increase of 2 in. in drop the number of bruised tubers increased 2.7 percent. The percentage of bruised tubers was found to be in inverse relation to the amount of soil carried on the digger chain. The amount of soil carried on the digger chain was found to be in inverse relation to the speed of operation and in direct relation to the depth of digging.

Height of row ridge on 254 farms varying from 2.5 to 9 in. seemed to bear no relation to tuber bruising. It is therefore assumed that ridging has no direct effect on the amount of soil carried by the digger. Increase in height of ridge was associated with a reduction in the percentage of cut tubers. This may be due to the fact that tubers set higher under ridge than under level culture.

A test of digger operation under controlled conditions demonstrated that reduced speed of the digger chain and deeper setting of the digger are equally effective in avoiding tuber injury. The digger equipped with a continuous elevator bruised about 60 percent fewer tubers than when the same digger carried a rear elevator.

Use of farm machinery for corn-borer control in the one-generation area. R. M. MERRILL (*U. S. Dept. Agr. Circ. 321 (1934), pp. 11, figs. 10*).—The results of experiments conducted by the Bureau of Agricultural Engineering are briefly described. They indicate that one of the greatest aids to efficient control of the European corn borer by mechanical methods is the practice of level cultivation of corn. A cornfield left excessively ridged by cultivation is difficult to plow or rake cleanly and also handicaps somewhat the low-cutting harvesting machinery. Slightly ridged corn, however, does not offer these difficulties.

Investigations on machinery used in spraying.—I, Nozzles. C. DAVIES and G. R. B. SMYTH-HOMEWOOD (*Jour. Southeast. Agr. Col., Wye, Kent, No. 34 (1934), pp. 39–62, figs. 12*).—The results of studies of spray nozzles are reported, the purpose being to ascertain the capabilities for performance of different types.

It was found that the smaller the disk orifice the smaller was the spray cone and the less was the carry. Variations in disk orifice also affected to some extent the thickness of the ring patterns. Variations in orifice diameter had no effect on atomization. Irregularities in the shape of disk orifices and in the countersunk portion of the disks adversely affected the spray cones. Increases in the thickness of the disks decreased the diameter of the cones and decreased the atomization, increases in pump pressure increased atomization, carry, and back pressure and altered the diameter of the cones, and increases in eddy-chamber depth increased carry, output, and back pressure and decreased atomization and diameter of the spray cones. Increases in size of vortex openings, whether holes or channels, increased carry, output, and back pressure, and decreased the atomization and diameter of the cones, and irregularities in the shape or disposition of vortex openings tended to produce spray patterns heavier on one side, or in parts, than the other. The symmetry of the spray cones was better at distances of 3 ft. and less; beyond this the stationary patterns generally lost their regular shape. Losses of spray liquid, caused by gravity and air resistance, occurred at distances from the

nozzles which varied with variations in those factors governing carry. In the main, the greater the carry the less the loss at given distances.

The advantages of higher pressure (from 400 to 800 lb. per square inch) than are usually employed were greater output, increased carry, and better atomization. The disadvantages were increased losses due to leaks, breakdown of parts not designed to deal with the greater stresses, and a loss of symmetry and uniformity in the spray cones. This seems to point to the desirability of having nozzles especially designed for high pressure work.

A portable small grain thresher, A. G. WEIDEMANN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 4, pp. 346-352, figs. 2).—A small grain thresher, the basic principles of which were developed at the Michigan Experiment Station, is described and illustrated.

The barrel seed scarifier, W. M. HURST, W. R. HUMPHRIES, and R. MCKEE (*U. S. Dept. Agr. Leaflet 107* (1934), pp. II+5, figs. 2).—A home-made scarifier developed by the U. S. D. A. Bureaus of Agricultural Engineering and Plant Industry is briefly described which has been found suitable for use in scarifying small lots of seed on farms.

The treatment of laundry wastes, J. A. BOYER (*Tex. Engin. Expt. Sta. Bul.* 42 (1933), pp. 15).—Studies are reported the results of which indicate that a trickling filter rather than chemical methods or a Dunbar filter should be used to treat laundry wastes.

It was found that a trickling filter 6 ft. deep, operating at a rate of 1,000,000 gal. per acre per day and treating a raw waste with an average biological oxygen demand of not over 450 p. p. m., will produce an effluent suitable to discharge into a stream or storm sewer. A 75 percent reduction of biological oxygen demand may be expected.

Ferric sulfate, ferric chloride, and aluminum sulfate will reduce the biological oxygen demand of laundry waste from 90 to 95 percent and produce a satisfactory effluent. Sludge and scum will be troublesome byproducts. Careful adjustment of pH value of the raw waste to 6.6-6.4 is necessary for economical results with chemicals.

On account of the necessity of fine screening the applied waste, the troubles caused by clogging, and the inferior effluent produced, the Dunbar filter is not recommended for the treatment of laundry waste.

Fuel from sewage and cellulosic waste, R. E. HUSSEY, S. B. ROW, and W. W. ALLISON (*Va. Engin. Expt. Sta. Bul.* 18 (1934), pp. 50, figs. 8).—The results of an investigation are reported the purpose of which was to determine whether or not the amount of gas generated during the digestion of sewage solids at the sewage disposal plant of the Virginia Polytechnic Institute would be sufficient to supply the requirements of the college laboratories. Studies also were made to determine the increase in gas production by adding certain cellulosic wastes to the digestion tank.

It was found by controlled experiments that digestion at 25° C. produced 9.3 cu. ft. of gas, or 5.9 cu. ft. of methane, per pound of dry suspended solids. Thus it should be possible by heating the plant digestion tank to 25° to obtain an average of 3,125 cu. ft. of gas, or 1,972,090 B. t. u., per day. It was shown by experiments that by the addition of about 60 lb., or about 17.2 percent, of waste paper the gas production could be increased by 10.7 cu. ft. of gas, or 5.2 cu. ft. of methane, per pound of paper, raising the average gas production at the plant to 3,767 cu. ft. of gas, or 2,282,530 B. t. u., per day. Since the gas requirements of the college laboratories for 1931 amounted to from 728,864 B. t. u. to 974,932 B. t. u. per day, the excess available for heating the digestion tank would be from 997,158 B. t. u. to 1,243,227 B. t. u. per day from

the sewage alone, and by the addition of 60 lb. of waste paper per day this excess would be increased to between 1,317,598 B. t. u. to 1,553,667 B. t. u. Peanut hulls, on addition to the digestion tank, produced 1.5 cu. ft. of gas, or 0.58 cu. ft. of methane, per pound. Extracted leaf waste digested easily and gave a yield of 3.9 cu. ft. of gas, or 2.3 cu. ft. of methane, per pound of waste.

AGRICULTURAL ECONOMICS

[**The agricultural situation**], 1934, H. A. WALLACE (*U. S. Dept. Agr., Sec. Agr. Rpt., 1934*, pp. 1-74, 79-82).—The economic policies and work of the Department are discussed under the following headings: Toward a balanced abundance, social costs of farm adjustment, foreign trade is one alternative, reciprocal trade agreements, the drought, an ever-normal granary, farm results of recovery policies, marketing agreements, protection of consumers, processing taxes, farm real estate taxes, cotton, wheat, corn and hogs, dairy industry's problem, sugar, rice, tobacco, unemployment and subsistence farming, land-utilization problems, type-of-farming studies, and the shift toward grass and forage.

The legislation of importance to agriculture passed at the second session of the Seventy-third Congress is described, and recommendations are made for amendments to the Agricultural Adjustment Act and the Grain Act.

General economic research [of the Bureau of Agricultural Economics, 1934] (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1934*, pp. 17-29).—Data are presented as derived from studies of the processing taxes, the tariff on fruits and vegetables, price spreads between producers and consumers, farm income, consumption of butter and wheat flour, losses in weight of tobacco from fresh curing to the time of manufacture, cotton-fiber structure and wastes, effect of ginning operations and sisal bagging on quality, relation of farm prices to quality, farm taxation, reduction of farm-mortgage indebtedness, and causes of failures of country banks.

Current Farm Economics, Oklahoma, [December 1934] (*Oklahoma Sta., Cur. Farm Econ., 7 (1934), No. 6*, pp. 97-122, 124-126, figs. 5).—Included are reviews of the general agricultural situation and the cotton situation, by L. S. Ellis; the wheat situation and the broomcorn situation, by R. A. Ballinger; the livestock situation, by P. Nelson; the poultry situation, by H. Miles; and the dairy situation and outlook, by A. W. Jacobs. Articles are also included on the Grades of Wheat Purchased from Farmers' Cooperative Grain Elevators in Oklahoma, by Ballinger and A. A. Orr (pp. 104-107); and on A Plan for Bringing Economic Equality to American Farmers, by J. T. Sanders (pp. 119-122). The usual tables on prices and purchasing power of farm products and demand deposits are included.

[**Report of the Secretary for Agriculture of South Africa, 1934**], P. R. VILJOEN (*Farming in So. Africa, 9 (1934), No. 105*, pp. 469-529, fig. 1).—This report for the year ended August 31, 1934, includes sections on the position of the chief agricultural products, cooperation, imports and exports, the surplus problem, boards of control, markets, the maize industry in relation to the livestock industry, fodder preservation and combating droughts, stock improvement and export of meat, grass and pasture improvement, soil erosion, agricultural education, financial and other governmental measures applying to agriculture, levies on agricultural products, agricultural research, and agricultural extension and education.

International aspects of the agricultural adjustment program, A. HOBSON (*Jour. Farm. Econ., 16 (1934), No. 3*, pp. 365-386, figs. 6).—The probable effects

of the agricultural adjustment program of the United States on the foreign markets, especially for agricultural products, are discussed. The author states, in concluding: "We sunk into this depression. We cannot crawl out painlessly under an anesthetic of nationalism. The pain will be no more severe and the advantages immeasurably greater if our national policy be generously flavored with an international point of view. While declining agricultural exports may not have caused the depression, certainly their loss contributed substantially to its severity. A recapture of these markets may not in itself banish the depression, but it is doubtful if lasting agricultural prosperity can be obtained without a revival of agricultural export movements."

Significance of South African agricultural development, C. C. TAYLOR (*Jour. Farm Econ.*, 16 (1934), No. 2, pp. 258-264).—The present development and probable future of the production of wool, cattle, citrus and deciduous fruits, wheat, corn, sugar, tobacco, and cotton are discussed. The author concludes that "in planning an American agricultural production policy serious consideration must be given to impending agricultural developments in South Africa. These developments indicate (1) a decrease in production of wool, mohair, and exportable corn, (2) an increase in the production of cattle, citrus fruit, deciduous fruit, and sugar, (3) a probable increase in the production of cotton and tobacco, especially by natives in countries south of the Equator other than the Union of South Africa."

Coffee in 1931 and 1932: Economic and technical aspects (Roma: Internatl. Inst. Agr., pp. 231, figs. 12).—This is an English edition of the report previously noted (E. S. R., 70, p. 860).

A national cattle policy, E. S. ARCHIBALD (*Sci. Agr.*, 15 (1934), No. 3, pp. 133-157).—Feeds and feeding, freight rates, regionalizing production, marketing of beef cattle and dairy products, breeding policies, health of cattle, distribution policies, credits, and exhibitions are discussed. The author states that his analysis of the different aspects of this problem must be considered at this time as a basis for discussion rather than as mature recommendations of any group of technical agriculturists.

Land classification as a basis for land use planning, C. H. HAMMAR and H. JENNY (*Jour. Farm Econ.*, 16 (1934), No. 3, pp. 431-443, figs. 4).—This contribution from the Missouri Experiment Station outlines, discusses, and illustrates a plan of land classification, using maps showing the texture, stone content, acidity, subsoil, root penetration, nitrogen content, phosphorus content, slope, physiography, natural vegetation, precipitation, growing season, frost dates, etc.

Nature and distribution of types of farming in Washington.—Types of farming series, III, N. W. JOHNSON and R. E. WILLARD (*Washington Sta. Bul.* 301 (1934), pp. 64, figs. 45).—This is the third bulletin of the series previously noted (E. S. R., 72, p. 119). The physical, economic, and biological forces determining types of farming in Washington are described. Maps show for 1929, by counties, the geographical distribution of the principal crops grown and main livestock enterprises and the approximate number and location of different types of farms—cash-grain, crop-specialty, fruit, dairy, poultry, general, truck, animal-specialty, and self-sufficing farms and stock ranches. Other tables, charts, and maps show the relative importance of various types of farming in the irrigated and nonirrigated sections of the State, the variations in the use of land, size of farm, valuation of land and buildings and machinery and equipment, and tenure of farm operators. A brief summary is presented of the more outstanding aspects of the agriculture in the western, central, and eastern parts of the State.

Part-time farming survey, State of Washington (Statistical summary) (*Washington Sta., 1934, pp. [108], pl. 1*).—This is a mimeographed statistical summary of the data from 1,814 schedules secured in cooperation with the Division of Subsistence Homesteads, U. S. Department of the Interior, and the Federal Civil Works Administration. The 97 tables included cover, by counties, types of roads; previous and present occupations; nationalities; years of farming experience of the farmers; type, size, and facilities of houses; number of school children; distance to schools; size, value, and tenure of farms; number and value of different kinds of livestock; value of vegetables, fruits, fuel, poultry, dairy and livestock products raised, sold, and used by families; farm and family expenses; rent paid by tenants; payments for taxes, insurance, and repairs; income, gross and net, from occupational sources other than the farm; methods of purchase, indebtedness, delinquent payments, etc.; sex, age, etc., of parents and children; relief status of families; membership in organizations; hours of labor contributed by members of families; stump clearing; irrigation; drainage; use of fertilizer; and other related data.

Agricultural outlook for Illinois, 1935 (*Illinois Sta. Circ. 426 (1934), pp. 31, figs. 7*).—The general agricultural situation in the United States and Illinois, and the outlook for different feed crops, hay, feedstuffs, and other crops, different kinds of livestock, livestock and poultry products, dairying, fruits, vegetables, and forestry, in Illinois, are discussed.

The place of pasture in Iowa farming, E. B. HURD and H. L. THOMAS (*Iowa Sta. Bul. 323 (1934), pp. 217-248, figs. 20*).—"The purposes of this bulletin are: (1) To present a detailed description of the types of pasture in Iowa in acreage, type, and yield of pasture in the different areas; (2) to find the reasons for variations in acreage, type, and yield; and (3) to show how these variations or differences relate to the rest of the farm organization." It is based on data from the Iowa Weather and Crop Bureau, the 1930 Federal Census, and a survey made in 1930 in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Maps and charts are included and discussed showing the effects of topography, drainage, and land tenure in determining the pasture acreage, the types of pasture, the relation of pasture to other crops, pasture utilization, and the influence of pasture upon the livestock systems in different parts of the State. Pasture management is discussed briefly.

An economic study of land utilization in Montgomery County, 1932, F. F. HILL and G. T. BLANCH (*[New York] Cornell Sta. Bul. 613 (1934), pp. 50, figs. 7, map 1*).—The topography, climate, soils, transportation facilities, and markets of the area are described and a brief history given of its agriculture. On the basis of land use, soil, and building classification maps, the lands other than those used for urban, suburban, and village purposes were classified according to intensity of use to which apparently adapted into four classes as follows: Class 1, primarily forest or recreation lands containing approximately 5 percent of the area; Class 2, lands better adapted to forestry and recreational uses than to agriculture, including approximately 14 percent of the area; and Classes 3 and 4, agricultural lands, the latter being adapted to more intensive use and containing approximately 49 and 27 percent, respectively, of the area. Tables are included and discussed showing for each class the acreages and percentages of land idle, in woodland and brush, in different kinds of pasture, in different kinds of hay and crops, and the different soil types; yields of different crops; percentages of buildings occupied, vacant, and gone or falling down; numbers of good, average, and poor farms; value per acre; school population, enrollment, attendance, and expenses per pupil.

etc.; miles of roads of different types; miles of electric lines and estimated revenue per mile, etc. Other tables show acreages and yields of different crops on different soils, percentage of buildings, value of lands and buildings, and consumption of electricity, possible increase, etc., on roads of different kinds.

[Investigations in farm management, 1932-34] (*West Virginia Sta. Bul.* 263 (1934), pp. 36-38, fig. 1).—Included are some findings (1) in a study of land utilization in the Huntington area of the State as to labor income on farms, 1931-32 and 1932-33, number of farmers having income from sources other than the farm, and topography of land; and (2) in a study of the use of power on 450 farms in various parts of the State as to the age of horses on tractor and nontractor farms, number of stationary engines, use of electricity, and number of trucks and automobiles.

Farm management practices and returns in the Big Horn Basin [Wyoming] (*Wyoming Sta. Rpt.* 1934, pp. 7-9).—Some findings by A. F. Vass and H. Pearson as to the factors affecting the returns from agriculture in the area are given, based on records from 83 farms.

America's capacity to produce, E. G. NOURSE ET AL. (*Washington, D. C.: Brookings Inst.*, 1934, pp. XIII+608, pl. 1, figs. 41).—This is the first of a 4-volume series on the Distribution of Wealth and Income in Relation to Economic Progress. Consideration is given to "our system of production realistically as a technological process, with a view to ascertaining the general trend of capital expansion in the United States and the capacity of our productive plant and labor supply to produce the goods and services which society requires." The period 1900-1930 is dealt with in longitudinal section with a view of determining whether plant capacity has shown a tendency to accumulate so fast as to outrun opportunity for its productive use, and a detailed cross-section examination is made for the period 1925-29 to determine whether actual production utilizes the full productive capacity.

The three parts cover raw materials, fabrication, and services. Appendixes cover the methods used in adjusting figures for agricultural capital, measuring productive capacity in mining, notes on the statistics of rated capacity of portland cement mills and on electric utility capacity, and detailed labor data and computation methods used.

America's capacity to consume, M. LEVEN, H. G. MOULTON, and C. WARBURTON (*Washington, D. C.: Brookings Inst.*, 1934, pp. XI+272, pls. 9, figs. 11).—This is the second volume in the series noted above.

Part 1, The Income of the American People, shows the amount and sources of the national income, 1900-1929, the division of the aggregate realized income among the different functional groups, among individual and family groups classified by the relative amounts received, and geographically between farm and nonfarm population.

Part 2, The Disposition of Income, shows the allocation of expenditures among the major types of consumers' goods and the amount and character of American consumption as a whole, indicates the amount of income spent by the several income groups compared with the amount saved and its bearing upon the division of the aggregate income between spending and saving, and discusses the trends in savings from 1900 to 1929.

Part 3, Consumption in Relation to Production, indicates the extent to which the magnitude and character of the demand for consumption goods would be modified by slight increases in the purchasing power of the lower income groups, compares these consumptive potentialities with the productive capacity of the nation, and considers the bearing of the analysis on certain important current

issues, such as the fear of overproduction, amount of leisure compatible with high standards of living, and length of the working day.

Statistical appendixes (pp. 137-265) on income and its distribution and the utilization of income are presented as a basis for the analysis of America's capacity to consume and as a basis for the discussion of the relation between the distribution of income and economic progress.

The following conclusions are drawn and briefly elaborated on: "During the so-called 'new era' of the gay twenties the United States was not living beyond its means. . . . There has been a tendency, at least during the last decade or so, for the inequality in the distribution of income to be accentuated. . . . Vast potential demands alike for basic commodities and for conventional necessities exist in the unfulfilled wants of the masses of the people, both rural and urban. . . . The United States has not reached a stage of economic development in which it is possible to produce more than the American people as a whole would like to consume. . . . We cannot materially shorten the working day and still produce the quantity of goods and services which the American people aspire to consume. . . . In emphasizing the need of increasing consumption, we must not forget the necessity of simultaneously expanding production."

Measures of major importance enacted by the 73d Congress, compiled by V. E. HIRTZ (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 54 (1934), pp. [63]).—This mimeographed list "is designed to meet the need of the Bureau of Agricultural Economics for readily available information on laws passed by the 73d Congress and on recently organized Government agencies whose work bears some relation to the work of this Bureau. . . .

"To these have been added some less important laws and some resolutions, including two resolutions adopted by the 72d Congress, because of interest to the Bureau. Executive orders and proclamations were consulted and in many instances have been cited, but it must be kept in mind that this information is incomplete and subject to amendment and change at any time by the issuance of further Executive orders and proclamations."

Inflation and the farmer, R. A. LESTER (*Jour. Farm Econ.*, 16 (1934), No. 3, pp. 410-416).—The effects of past inflations in the United States, Germany, France, and other European countries are reviewed. The author finds that "in each and every instance there has been a disparity of prices unfavorable to the farmer producing for the domestic market, interest rates and taxes have increased, and land values have not increased in proportion with the increase in prices and other capital values." He concludes that "a moderate or gradual rise in the price level (fall in the value of the dollar) might well, under certain conditions, be to the benefit of farmers producing for local consumption. That would certainly be the effect if thereby manufacturing was so stimulated that the farmer could more favorably exchange his crops for his share of an increased industrial output. But an inflation at all comparable with any of those mentioned above would surely be detrimental to the best interests of American agriculture."

The bounty and processing tax on wheat in Hungary, M. LYSKY (*Jour. Farm Econ.*, 16 (1934), No. 3, pp. 387-409, figs. 6).—The author describes the boletta, or grain ticket, system established in Hungary June 15, 1930, and discusses its effects on the price of wheat, flour, and bread, its benefits, its cost, and its relation to the national economy.

An index of farm real-estate taxes in Kentucky, C. J. BRADLEY, H. B. PRICE, and B. W. ALLIN (*Kentucky Sta. Bul.* 352 (1934), pp. 185-200, figs. 4).—This study was made in cooperation with the Bureau of Agricultural Economics,

U. S. D. A., and is based on tax records for 710 farms in 23 counties in 1913-31, for 485 farms in 116 counties in 1932, and for 10 representative farms in each of the 120 counties of the State in 1933. Tables and charts are included and discussed showing by years the farm real-estate taxes per acre and per \$100 of value for the farms studied and in the United States, and for the Kentucky farms the taxes per acre and the index numbers for State, county, and school purposes, and the indexes for 23 counties for the farm real-estate taxes per acre. Other tables show the gross income from production and the taxes per \$100 of gross income, 1924-32, in Kentucky and the United States.

The taxes in Kentucky increased from 16 ct. per acre in 1913 to 43 ct. in 1927 and then decreased to 33 ct. in 1933, as compared with 24 ct. in 1913, 58 ct. in 1928 and 1929, and 39 ct. in 1933 for the United States. The Kentucky taxes per \$100 of value were 52 ct. in 1914, decreased to 37 ct. in 1918, increased to \$1.03 in 1923, ranged from 94 ct. to \$1.02 for the years 1924-29, and then increased to \$1.39 in 1932. In the United States there was an increase from 55 ct. in 1913 to \$1.01 in 1923 and to \$1.50 in 1932. Gross income per acre in Kentucky was \$11.50 in 1924 and \$12.04 in 1925 and then decreased to \$5.82 in 1932, as compared with \$12.19, \$12.95, and \$5.08 in the United States. The taxes in Kentucky per \$100 of gross farm income were \$3.48 in 1924, ranged from \$3.32 to \$3.90 in the period 1925-29, and increased to \$4.84 in 1930 and to \$6.53 in 1932. In the United States they were \$4.51 in 1924, ranged from \$4.32 to \$4.75 during the period 1925-29, and increased to \$5.98 in 1930 and to \$9.06 in 1932.

A handbook of Michigan tax laws, F. M. THRUN (*Michigan Sta. Circ. 153* (1934), pp. 136).—This handbook contains detailed abstracts of all laws of the State pertaining to taxation. In general, each tax is handled under sections on history, assessment and collection, and distribution of funds.

Tax delinquent rural lands in Arkansas, C. O. BRANNEN (*Arkansas Sta. Bul. 311* (1934), pp. 63, figs. 6).—Data were obtained from official records, 1928-33, as to acreage, assessed valuation, and taxes on all lands, and as to taxes charged, penalty and cost, date of redemption, etc., for all delinquent rural lands sold to individuals, and as to lands previously forfeited and belonging to the Federal Government. Data were also obtained in 24 counties as to sale price and date of sale of all tax deeds during the 6-yr. period, and in selected counties as to delinquency by types of property and by school districts in 1931 and 1933. Tables, charts, and maps show by counties, by years, the percentages of farm land delinquency, the percentages delinquent and State owned and being forfeited, 1928 and 1933, the percentages of all property delinquent, the percentages of different types of property delinquent, 1931 and 1933, the percentages of rural drainage and levee district assessments delinquent, by years, 1928-33, and the percentages, 1932 and 1933, that the areas actually certified to the State were of the areas due for such certification. The total fees and costs and the fees and penalties collected on delinquent taxes are shown by years. The causes of delinquency are discussed and suggestions made for remedying conditions.

The percentages of rural land on which taxes were not paid increased from 4.7 to 5 percent in the years 1928-30, to 15.9 in 1931, and 19.8 in 1933. The percentages of rural lands that were delinquent and forfeited or being forfeited to the State increased from 4.5 and 4.4 in 1928 to 14.8 and 16.8 in 1933. The percentages of all property delinquent increased from 7.2 in 1928 to 8.1 in 1930, 14.3 in 1931, 14.8 in 1932, and 21.3 in 1933. Delinquency of rural drainage and levee district assessments increased from 24.4 in 1928 to 72.5 in 1933.

Standards of practice for rural appraisers (*Jour. Farm Econ.*, 16 (1934), No. 3, pp. 515-524).—This is the report of the subcommittee on appraisals of the National Joint Committee on Rural Credits. It is divided into three parts on ethics, definitions, and procedure. Suggestions are also included on the application of the principles to actual farm appraisals.

Farm real-estate values in the New England States, 1850 to 1930, W. I. GOODWIN (*Washington: U. S. Bur. of the Census, 1933, pp. 123, figs. 23*).—"This is a study of farm real-estate values and their principal related factors in New England from 1850 to 1930." The 1930 and earlier censuses comprise the principal sources of data.

Tables, maps, and charts are included and discussed showing in actual figures the index numbers or percentages for each census (1) for New England and the other geographic divisions of the United States the average value per acre of all farm real estate, 1850-1930, of all farm buildings and land, 1900-30, and farm dwellings, 1930; (2) the same data for New England, by States and counties, together with data showing the average value per acre of implements and machinery, 1920, 1925, and 1930, the number of farms per square mile, 1850-1930, acreages in farms, 1850-1930, and in crop land, pastures, and woodland, 1924 and 1929, population per square mile and per 100 acres of all land in farms, 1850-1930, and per 100 acres of crop land, 1929, total farm, rural farm, and urban farm population, 1930, farm-city and city-farm population movements during the year ended April 1, 1930, value of principal crops and livestock products, 1909, 1919, and 1929 (by States only), average farm prices of selected crops and livestock products, average value per acre of farm products sold, traded, or used by operator's family, 1929, for cash tenants the number of farms reporting, acreage, rent paid, and ratio of rent to average farm real-estate value, 1929, average expenditures per acre for labor and fertilizer, 1899-1929, percentage of farms of different types, 1930, average acreage and value per acre of all farm real estate for the different types of farms, 1930, percentage of each type with different farm facilities, 1920 and 1930, number of all farms on different kinds of roads, 1925-30, population, total and per square mile, 1920 and 1930, and land area and farm population, 1930; and (3) by metropolitan areas, 1920 and 1930, the population, total and per square mile, land area and farm population, 1920, and average value per acre of all farm real estate, and by principal agricultural and industrial areas the value, 1930, total and per acre, of all farm real estate.

Suggestions to purchasers of farms, W. L. CAVERT and G. A. POND (*Minnesota Sta. Bul. 309 (1934), pp. 16*).—Suggestions are made as guides that may be used in selecting a farm. Tables are included showing (1) a method of evaluating a farm on the basis of the landlord's share of the crop, and (2) the relations to capitalized value per acre of crop index, proportion of tillable land, size of farm, and percentage of farm in the more profitable crops.

Branch banking and its bearing upon agricultural credit, J. K. GALBRAITH (*Jour. Farm Econ.*, 16 (1934), No. 2, pp. 219-232).—This contribution of the Giannini Foundation of Agricultural Economics of the University of California describes the meaning and general aspects of branch banking, credit specification and adequacy of credit supply, and the economy and certainty of credit supply.

Principles of inland transportation, S. DAGGETT (*New York and London: Harper & Bros., 1934, [2. ed.], rev., pp. XXI+898, pls. 3, figs. 71*).—The development and present status of inland transportation facilities in the United States, the effects of improved transportation upon industrial society, commodity movements, rates and rate fixing, problems of administration, legislation affecting inland transportation, etc., are discussed. Other chapters describe the

relations between the public and the railways in England, France, and Germany.

Efforts to control marketing by government boards or organizations acting with government support, III, J. COKE (*Sci. Agr.*, 15 (1934), No. 1, pp. 55-58).—This last article of the series previously noted (*E. S. R.*, 71, p. 118) describes the situation in New Zealand, the British Marketing Acts, public utility control in Winnipeg (Manitoba) and New York (U. S. A.), and the U. S. Agricultural Adjustment Act of 1933.

Farmers' business organizations in Canada, A. E. RICHARDS (*Canada Dept. Agr. Bul.* 173, n. ser. (1934), pp. 63, figs. 11).—Tables are given and discussed showing, by Provinces and the Dominion for 1932, the number of farmers' business organizations, number of shareholders and members, assets, liabilities, sales, value of plant, reserves, etc., of organizations for different purposes. Analyses are made of the operations of 9 cooperative dairy companies in British Columbia, 8 in Alberta, Saskatchewan, and Manitoba, and 8 in Ontario and Nova Scotia, and a combined statement is given for 25 companies. Analyses are also made of the comparative operating percentages and unit costs of 6 cooperative dairy companies in the Dominion and of the operations of 10 cooperative fruit companies each in British Columbia and Nova Scotia.

An economic analysis of creamery operations in New Brunswick, C. V. PARKER and J. F. BOOTH (*Sci. Agr.*, 15 (1934), No. 1, pp. 52-54).—This is a brief synopsis of the results of a study of the 1932 operations of 11 creameries and covers costs of manufacture and transportation of cream, prices received for butter, etc.

An economic analysis of cheese factory operations in Quebec (*Ottawa: Dominion Dept. Agr. and Quebec Dept. Agr.*, 1933, pp. 37, figs. 6).—This analysis, prepared by the Dominion Department of Agriculture in cooperation with the Quebec Department of Agriculture, discusses the development, location, volume of business, number of patrons, capital investment, costs of manufacture, contract rates received by cheese makers, yield, quality, and sales of cheese, payment for milk, cost of hauling milk, competition of other uses for milk, etc.

A study of the consumption of dairy products in Minneapolis, 1934, W. C. WAITE and R. W. COX (*Minnesota Sta. Bul.* 311 (1934), pp. 28, figs. 7).—This study was made to determine the variations in the consumption per family and per capita of dairy products and the reasons for such variations. Data were obtained from January 15 to February 12, 1934, for 2,187 families (8,783 persons) in 228 selected areas of the city.

Over 96 percent of the families used fluid milk, the average per capita consumption per day being 0.85 pt., with 73 percent of the persons consuming 0.4 to 1.19 pt. Nearly 99 percent of the families used butter, the average per capita consumption being 0.65 lb. per week, the most common rate being from 0.5 to 0.74 lb. Sixty-five percent of the families purchased cream, the most common per capita consumption being 0.25 to 0.49 pt. per week. Over 72 percent of the families purchased cheese, nearly 30 percent evaporated and condensed milk, and over 50 percent ice cream, the average per capita consumptions being 0.49 lb., 0.71 lb., and 0.29 qt. per month. Maps show the average per capita consumption of milk, butter, and cream in different sections of the city. Presence of children and whether milk was used for drinking were the most important factors affecting consumption of milk. Income did not have a great influence.

The consumption of cream was dependent largely on income. Income greatly affected the consumption of butter. Number of children affected the total

consumption within the income group, but the per capita consumption decreased as the number of children increased. Consumption of cheese increased from 0.41 lb. per month in the low-income group (under \$300 per capita) to 0.74 lb. in the high-income group (\$900 and over per capita). The average per capita consumption of condensed and evaporated milk decreased from 0.84 lb. per month in the low-income group to 0.17 lb. in the high-income group. The per capita consumption of butterfat (all dairy products) increased from 3.11 lb. per month in the low-income group to 5.14 lb. in the high-income group. Monthly per capita expenditures for dairy products increased from \$1.92 to \$3.29. The percentage that expenditures for such products was of all expenditures for food decreased from 29.8 to 21.6. In 114 relief families studied the per capita consumption of fluid milk was about 10 percent less than that in the 2,187 families; that of evaporated milk 150 percent higher; that of butter 0.15 lb. less per week; and that of cheese 0.25 lb. less per month.

A survey of 600 retail stores showed a wide range in the price of similar grades of butter and a striking lack of correspondence between the scores and prices of butter. Increases in income may be expected to increase materially the consumption of fluid milk and butter in the lower-income group; increase the consumption of butter and fluid milk slightly and cream considerably in the middle-income group; and cause little change in the high-income group.

Financial operations of a group of Oklahoma farmers' elevators, 1930-1932, R. A. BALLINGER (*Oklahoma Sta. Bul.* 221 (1934), pp. 15, fig. 1).—Tables are included and discussed showing (1) for 31 cooperative elevators in 1928, 1929, and 1930, and 44 such elevators in 1931 and 1932, the average total sales; and (2) for 35 cooperative elevators in 1930, 53 in 1931, and 52 in 1933, the average sales of, gross income from, and gross income per dollar of sales, for wheat, other grains, and side lines, and the percentage distribution for each; the average distribution of expenses, total and per dollar, of sales for salaries and labor, buildings, and other expenses; and the average net gains and losses, total and per dollar, of sales. The elevators are grouped into three groups on the basis of average volume of sales.

Volume of sales in terms of dollars declined considerably during the period due to price declines. Gross receipts per dollar of sales increased. Average expenses did not decrease, although there was a decrease in salaries and labor. Each year a majority of the companies with sales of less than \$50,000 showed a loss, while those with sales of \$100,000 or over showed profits.

The significance of demand in the determination of the prices of beef and pork in Canada from 1920 to 1932, E. C. HOPE (*Sci. Agr.*, 15 (1934), No. 2; pp. 65-79, figs. 4; *Fr. abs.*, p. 79).—Correlation analysis is made for the years 1920-32 of the relations of supply of beef, demand for beef as shown by wages and salaries per capita, exports of cattle, supply of pork, supply of mutton, and time to the price of beef and veal, and of the supply of pork, demand for pork, exports of bacon, ham, and pork, and exports of lard to the price of pork. Of the price variations for beef and veal, 16 percent was attributed to supply, 54 to demand, 8 to exports, 13 to supply of pork, 6 to supply of mutton, and 3 percent to time. Of the variations in the price of pork, 28 percent was attributed to supply of pork, 30 to demand, 30 to exports of ham, bacon, and pork, and 12 percent to exports of lard.

Report on experimental shipment of chilled beef to Britain, A. M. SHAW (*Sci. Agr.*, 15 (1934), No. 3, pp. 158-164).—Comparisons are made of the returns from three shipments of cattle and beef from Saskatoon, Saskatchewan, and sold in Smithfield, England, as follows: 26 head shipped alive to Birkenhead,

England, 26 head shipped by rail to Montreal, slaughtered, chilled, and shipped by ocean refrigerator service, and 25 head slaughtered as Saskatoon, chilled, and forwarded by refrigerator car to Montreal and thence by ocean refrigerator service. The conditions of the shipments are described.

The net receipts per 800-lb. steer were when shipped alive \$41.30, slaughtered at Montreal \$37.15, and slaughtered at Saskatoon \$35.41. The returns from the offal of a steer slaughtered in Montreal were when sold fresh in Montreal \$3.14 and when shipped frozen to Smithfield \$5.02.

Trading in futures and price fluctuations, P. MEHL (*Jour. Farm Econ.*, 16 (1934), No. 3, pp. 481-495, figs. 2).—The investigations of the Bureau of Agricultural Economics, U. S. D. A., and other individuals and organizations are reviewed.

Fifteenth Census of the United States, [1930]: Distribution of grain, C. D. BOHANNAN (*Washington: U. S. Bur. of the Census, 1934, pp. 45*).—This bulletin is one of a series on the distribution of agricultural commodities. Data from the 1930 census of distribution and other official sources on the assembling and distribution of grain are presented in tables and discussed in sections on the economic importance of grain production; on elevators and other grain assemblers, including parts on elevators by types of control, retail sales, cooperative elevators, size and expenses by type of elevator, and the wholesale trade in grain; and on milling or processing of grain.

Fifteenth Census of the United States, 1930: The assembling of agricultural commodities by retailers, C. D. BOHANNAN (*Washington: U. S. Bur. of the Census, 1933, pp. 155*).—This is one of the series on the distribution of agricultural commodities noted above. The assembling by retailers refers to that part of the business of retail stores in areas outside of cities with populations of 10,000 and over which consists of purchases for their own accounts or on a commission basis and the handling of one or two farm products for shipment and/or sale to another distributor, processor, or manufacturer. The report consists chiefly of three tables showing (1) by States and kind of business the number of stores reporting and not reporting the assembling of commodities, the total value of commodities assembled, of those purchased on salary or commission, the sales to other dealers, and retail sales by those assembling commodities, and the retail sale value of commodities sold by the nonassembling stores; (2) by States and counties, similar data for the stores assembling commodities and also the number of stores reporting credit business and the amount of credit and its percentage of retail sales; and (3) by States and kind of business, the amount of credit sales and its percentage of all retail sales for assembling and nonassembling stores. The first two tables also include data as to the number of stores assembling butter, eggs, poultry, fruits and vegetables, cream, and cotton.

Ohio agricultural statistics, 1933, G. S. RAY, A. R. TUTTLE, and P. P. WALLRABENSTEIN (*Ohio Sta. Bul. 542 (1934), pp. 49, fig. 1*).—This bulletin prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A., continues the series previously noted (*E. S. R.*, 70, p. 711). It includes among other data preliminary county estimates of the acreages, yields per acre, and the total production of winter wheat, oats, tame hay, and potatoes, for 1933, of the numbers of livestock on farms, January 1, 1934, and the revised estimates of number of sheep, 1933. Estimates of corn and hogs are omitted as the corn-hog reduction data were not completed.

RURAL SOCIOLOGY

Rural social and economic areas in central New York, D. SANDERSON ([*New York*] *Cornell Sta. Bul.* 614 (1934), pp. 100, figs. 18).—This is one of a series of reports on studies designed to determine the geographic basis of the social organization of rural society (E. S. R., 65, p. 786; 66, p. 888; 70, p. 414; 71, pp. 270, 271, 552) and conducted in cooperation with the U. S. D. A. Bureau of Agricultural Economics. The bulletin summarizes the findings of the previous publications, presents additional data for Otsego County and further statistical analyses of the data obtained in the various surveys, and makes a general interpretation of the results. Economic and social areas are mapped showing contacts of rural people, and it is suggested that the data presented should prove valuable in rural planning.

Trends of country neighborhoods, J. H. KOLB (*Wisconsin Sta. Res. Bul.* 120 (1933), pp. 56, figs. 20).—This is a restudy of 121 neighborhoods in Dane County originally mapped in 1921 (E. S. R., 46, p. 894).

Of these, 95 were considered as active, that is, they were going concerns, carrying on group activities or having recognizable factors holding the group together and giving it some sense of unity or group consciousness. Sixty-three of them could still be classed as active in 1931, while only traces of most of the other 32 could be found. Seven groups considered as inactive in 1921 rose into the active ranks in 1931, making a total of 70 neighborhoods active in 1931 which had previously been studied.

It is deemed evident that Dane County country neighborhoods are persisting. New groups are forming to take the places of those which fall by the way. Special interest and various types of activities are playing a larger part in this group life, though locality continues to be important. Neighborhoods with vital interests and modern activities furnish an outlet of expression and create a healthy morale for country people. Farmers and villagers are mingling more freely and in more contacts than they did 10 yr. ago. Both are recognizing more fully their interdependence. Because of this the community of country and village or small town is assuming greater significance.

The life cycle of the farm family, E. L. KIRKPATRICK, R. TOUGH, and M. L. COWLES (*Wisconsin Sta. Res. Bul.* 121 (1934), pp. 38, figs. 3).—Of a total of 900 families visited in 1929 (E. S. R., 69, p. 613), 267 were revisited in 1932. They were drawn from six major types of farming areas of the State. The stages were based on children, including pre-school, children under 6 yr. of age; grade school, children from 6 to 13 yr.; high school, children from 14 to 18 yr.; and all-adult, children of 19 or more years. The pre- and post-child stages received little consideration.

About 25 yr. are required for a family to pass from the pre-school to the post-school, or adult stage. The average farm family increases in size from 4.1 persons in the pre-school group to a maximum of 5.1 persons in the high school group, and then returns to its former size in the all-adult group.

Goods and services furnished by the farm for family use include food, rent, and fuel. Ordinarily the cost of furnished food comprises at least one-half of the cost of all furnished goods, and the greater the pressure on the family from lack of funds, the greater will be the proportion of the total furnished living going into food.

House rent shows a tendency to decrease through the first three stages of development. Fuel furnished by the farm takes the form of wood used for heating purposes and as a substitute for coal. Food retains a relatively

constant place among the purchased goods and services. In contrast, clothing assumes much greater significance in the high school and all-adult groups than in the two earlier stages of family development. Food consumption per person and per adult male unit varies with the period of family development reached. The young family just starting out consumes a high amount of many types of food, but as the children arrive the total consumption per household increases but the amount per person drops.

The expenditures for clothing increase from \$160 to \$278 per family for the four stages of family development. A pronounced increase in expenditures for advancement goods and services occurs in the high school and all-adult groups. Expenditures for personal goods and services remain relatively constant throughout the first three stages of development but increase materially in the all-adult stage. Expenditures for health maintenance decrease noticeably from the pre-school to the high school groups and rises for the all-adult groups. The expenditures for life and health insurance follow the same trend. At each stage of development cash farm expense absorbs about one-half of the cash receipts. The amount of noncash contribution of the farm, goods and services furnished and consumed on the farm, average about \$500 at each stage of development.

In the majority of all families at each stage of development the income was regarded as inadequate; a larger proportion of families in the grade school group felt that it had insufficient funds to meet their needs than in any other group. In the four groups of families, from pre-school to all-adult, 27, 30, 28, and 10 percent answered that they were delinquent in tax payments. Higher percentages reported interest on obligations unpaid. The farm family's resources have been so depleted that in many instances there are no longer savings to draw upon and little or no credit available at any stage of family development.

Approximately three-fourths of the 267 families studied were farm owners. The proportion of owners increased from 50 percent for the pre-school to 94 percent for the all-adult group.

The younger farm operators and homemakers have more formal education than the older ones. Attendance at moving pictures markedly increased in the high school and all-adult stages as compared with the younger families. The hours spent at meetings and participation in local organizations are relatively high for the pre-school and grade school groups as compared with the two older groups.

When the economic organization is such that a large proportion of the families have inadequate income, making it impossible to plan for the future and, in addition, to meet current needs, grave social danger exists.

Rural young people, 16 to 24 years of age, C. E. LIVELY and L. J. MILLER (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 73 (1934), pp. 27*).—A survey of the status and activities of 300 unmarried individuals in nine Ohio townships.

FOODS—HUMAN NUTRITION

A shortened method for calculating the adequacy of family food purchases, R. OKEY and M. G. LUCK (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 1, pp. 12-19*).—A method which has been developed for use by assistants trained only in clerical procedures in recording family food purchases and computing and evaluating nutritive equivalents of the foods involves a series of tables and record cards, which are presented and discussed, with the final comment that "obviously the value of the results obtained in any study of the nutritive

adequacy of food consumed by a large group of people will depend upon the reliability of the original data used as a basis for the study and the representative quality of the sample chosen. We wish to emphasize the fact that such studies should not be undertaken without the services of a trained dietitian, not only for developing the original plan of the work but also for making the final analysis of the figures obtained."

Temperature control in the baking test with revolving shelves in proofing cabinet. W. O. WHITCOMB (*Cereal Chem.*, 11 (1934), No. 4, pp. 403-409, fig. 1).—In this contribution from the Montana Experiment Station, a proofing cabinet with revolving shelves to overcome temperature differences is described and illustrated with a diagram, differences in its construction and operation from other well-known cabinets are pointed out, and data are reported on the temperature control possible in the new cabinet. With careful control of the temperature of the room, the ingredients, and the cabinet, it has been found possible to maintain the temperature of the dough during the baking test at a temperature of $30^{\circ} \pm 0.5^{\circ}$ C. from the time it is mixed until it is placed in the oven.

Potatoes in storage (*Wyoming Sta. Rpt. 1934*, pp. 23, 24).—This is a progress report (E. S. R., 70, p. 866) on studies dealing with the effect of storage upon the vitamin C content and cooking quality of Irish Cobbler and Bliss Triumph potatoes.

Try quick freezing of many vegetables. S. P. MACDONALD (*Farm Res. [New York State Sta.]*, 1 (1935), No. 2, p. 2).—This is a brief report of studies conducted at the station in cooperation with a commercial laboratory on the adaptability of the principal vegetable crops of the State to preservation by quick freezing. Variety, maturity, proper processing, and adequate freezing facilities have been found to be the most important factors to be considered in this growing industry.

[Fruit products studies at the California Station] (*California Sta. [Bien.] Rpt. 1933-34*, pp. 106-110).—Progress reports are given on studies of the effects of fruits and fruit products on the alkaline reserve of the blood (E. S. R., 70, p. 718), the elimination of defects in olive processing, the cause of the darkening of certain fruits on exposure to air, the preparation of fermented and unfermented fruit juices (particularly orange juice), the prevention of deterioration in fruits and vegetables during freezing, storage, and subsequent thawing, and various problems connected with the drying of prunes.

A study of the diets selected by college students from a college cafeteria. E. LATZKE (*Jour. Home Econ.*, 26 (1934), No. 2, pp. 107-114).—In the first part of this study, which was carried out in 1930 in the cafeteria of the North Dakota Agricultural College, observations were made of the food selected by a representative number of students over two 10-day periods, one in the winter and one in the spring. A total of 1,665 trays was so observed, 785 of boys and 880 of girls, and divided almost equally between breakfast, lunch, and dinner. As compared with the generally accepted recommendations, the diet selections were poorly balanced and inadequate. The diets of the men were considered too high in breads, desserts, and meats, too low in fruits and vegetables, and nearly adequate in cereals and milk. The women made fair use of raw vegetables and fruits, but their diets were all light in milk, fruits, vegetables, and whole cereals, and too high in breads and desserts. The average costs of the meals, based on 1930 prices, were 80.9 ct. a day for the men and 71.3 ct. for the women. These figures are considered high in relation to food values received.

The second part of the study consisted of quantitative measurements of duplicate servings of the food selected by certain students who had eaten three meals a day at the cafeteria for more than 1 day, including 12 men and 20 women in the first period and 10 men and 11 women in the second period. In judging the adequacy of the diets, the calorie requirement was placed at 3,000 for men and 2,400 for women, the protein standard at 10 percent of the total calories, and calcium 0.68, phosphorus 1.32, and iron 0.015 g per day.

The calorie intakes for the men ranged from 1,411 to 3,453, with an average of 2,203 calories per day. The values for the women were even lower, averaging 1,674 per day. The protein intakes averaged 13 percent of the total calories for the men and from 12 to 13 percent of the total calories for the women. In grams per day, the protein intakes were practically standard for the men and 15.3 percent below standard for the women. For the men the calcium and phosphorus intakes were above and the iron 22.4 percent below the standards. For the women the calcium was 9.8 percent, the phosphorus 28 percent, and the iron 43.2 percent below the standards. The costs averaged 81 ct. a day for the men and 70 ct. for the women.

Various suggestions are given in possible explanation of the poor selection of foods from the cafeteria, and the conclusion is drawn that "under conditions such as those existing in this institution some plan of feeding should be adopted which would provide better balanced diets, and that this may be more efficiently accomplished when service is on a meal basis rather than a cafeteria basis."

A study of the dietary and growth rates of 24 girls, 6 to 15 years of age, while recovering from varying degrees of malnutrition, H. B. THOMPSON and A. SCHOLTZ (*Jour. Amer. Dietet. Assoc.*, 9 (1934), No. 6, pp. 462-471, figs. 2).—Observations are reported on the food consumption (inventory method) for 1 mo. and the height-weight gains for a period of 15 weeks of a group of previously malnourished girls 6-15 yr. of age at a health camp in California.

The dietary for the 24 girls and 4 adults furnished an average of 2,934 calories, 91 g protein, 1.45 calcium, 1.86 phosphorus, and 0.0151 g iron per person per day and was considered to contain a liberal supply of vitamins.

The gains in height of the individual subjects were not above the expected gains, averaging 0.043 in. for all but one of the 11 girls in the older group (11-15 yr.) and 0.06 in. per week for the 13 younger girls (6.5-10 yr.). The gains in weight during the 15 weeks were in 16 cases in excess of the expected yearly gains. Individual gains varied widely. In the older groups the maximum gain during the 15 weeks was 19.75 lb., the minimum 5.25, and the mean 11.75 lb. Corresponding figures for the group 6.5-10 yr. of age were 20.25, 1.5, and 7.75 lb., respectively.

Supplementary feeding for 60 days with avocado to the extent of 1.3 oz. a day caused no further stimulation of growth in the group receiving it over that of the control group.

The basal metabolism of Mapuchian Indians in Araucania [trans. title], J. PI-SUNER BAYO (*Compt. Rend. Soc. Biol. [Paris]*, 114 (1933), No. 29, pp. 112, 113).—Basal metabolism data were obtained with the portable apparatus of Benedict and a Krogh apparatus for 31 male subjects from 20 to 40 yr. of age and 14 female subjects from 20 to 45 yr. of age among the Mapuchian Indians, whose diet is said to be very low in protein.

The average values obtained were 9.3 percent above the DuBois and 9.8 percent above the Benedict standards for the males and 14.6 and 14.8 percent, respectively, above the same standards for females. The pulse rates were 60 and 67 for males and females, respectively. These values confirm those of

Steggerda and Benedict (E. S. R., 67, p. 474) for the Maya Indians as showing high metabolism and low pulse rates.

Growth and basal metabolism.—I, **Basal metabolism of preschool children**, I. NAKAGAWA (*Amer. Jour. Diseases Children*, 47 (1934), No. 5, pp. 963-969).—The Benedict respiration apparatus with cot chamber was used for this study of the basal metabolism of 31 healthy Japanese children, 15 boys and 16 girls, between the ages of 3 yr. 10 mo. and 6 yr. 6 mo. All of the tests were conducted in the autumn to exclude possible seasonal differences.

The basal heat production per 24 hr. was slightly higher for the boys than for the girls in the same age group, and per units of body weight and body surface decreased with age, as did the pulse rate and respiratory rate. The average heat production figures per day, 868 calories for the boys and 831 calories for the girls, were higher by 12.6 and 15.3 percent, respectively, than the Benedict-Talbot standards for boys and girls of the same age. These deviations from the standard values agreed quite closely with those reported by Wang and Hawks for Chinese children in the United States (E. S. R., 68, p. 410).

Some factors influencing nitrogen economy during pregnancy, C. M. COONS and G. B. MARSHALL (*Jour. Nutrition*, 7 (1934), No. 1, pp. 67-78).—Data are presented on 23 4-day nitrogen balance experiments during pregnancy and one 4 weeks prior to pregnancy on six women whose case histories have been presented elsewhere (E. S. R., 71, p. 879). The methods followed were the same as in an earlier investigation (E. S. R., 64, p. 492).

The nitrogen intakes varied from 8.08 to 19.13 g, with an average of 11.58 g daily. The retention varied somewhat, but in 14 cases was between 1 and 2 g. Differences in retention rates were apparently unrelated to any period of gestation. Tendencies to high storage were shown in only 2 cases, and these were associated with higher levels of intake, a relatively larger proportion of milk, meat, and eggs, and larger amounts of vitamin B.

The gains in weight of the different subjects during the time of the balance studies were similar, about 2 kg a month, but the total gains from the pre-pregnant weight to that at the end of gestation showed greater differences. In discussing these differences, the authors emphasize the need of knowing the nutritional history of the mother during all of gestation, as well as during the pregestation period, in order to interpret the findings for nitrogen retention during pregnancy. Positive and negative factors which influence nitrogen metabolism during pregnancy are summarized as follows:

“On the positive side are the impulses to replenish body reserves, to supply elements to a growing organism, and to provide for some vaguely defined but quantitatively large biological preparation for the losses of parturition and the puerperium and for the performance of lactation. Along with these come the increased desire for food, and consequent higher intake, the improved utilization, and the tendency to retain that absorbed or economize on protein catabolism, all a part of the normal events in any pregnancy. On the negative side, however, there may be operating one or more of such factors as the poor quality or limited quantity of protein available, a series of digestive disturbances such as nausea and ‘heartburn’ common to pregnancy, or other pathological conditions necessitating a restriction of the amount of protein available for absorption. Doubtless other unknown conditions affect one or more phases of the cycle of protein metabolism. It is surprising that the maternal organism adjusts itself as well as it does to all these varied influences.”

The use of evaporated milk in digestive disorders, particularly peptic ulcer, P. B. DAVIDSON, F. BIGURIA, and R. GUILD (*Jour. Amer. Dietet. Assoc.*, 9 (1934), No. 6, pp. 478-485, figs. 3).—This comparative study of the stimulating power upon the gastric secretion and the action on the emptying-time of the stomach of (1) ordinary milk, (2) evaporated milk diluted, (3) evaporated milk undiluted, and (4) a mixture of milk and 20 percent cream was carried out on normal subjects, ulcer patients, and on normal and Pavlov pouch dogs.

In both human subjects and the Pavlov pouch dog diluted evaporated milk and ordinary milk tended to lower the free HCl of the fasting stomach, ordinary milk being slightly less effective. In the human subjects undiluted evaporated milk and the milk and cream mixture lowered the free HCl of the fasting stomach to about the same degree, but in the Pavlov pouch dog lower acid values were obtained with undiluted evaporated milk than with the milk and cream mixture. Both were less stimulating than either diluted evaporated milk or ordinary milk.

In normal subjects and in non or partially obstructed peptic ulcer patients the emptying time of the stomach was the same for ordinary milk and diluted evaporated milk, but in the normal dog the emptying time was shorter for diluted evaporated milk than for ordinary milk. No difference was evident in the time of emptying the stomach of undiluted evaporated milk or a milk and cream mixture in normal subjects or peptic ulcer patients, but in the normal dog the emptying time seemed slightly longer for undiluted evaporated milk.

"With regard to the influence on gastric acidity and motility, the above experiments seem to indicate that evaporated milk diluted and undiluted may be used as well as milk, and milk and cream mixtures, in the treatment of conditions that require a bland or semibland diet."

A study of the therapeutic value of yeast, F. A. BROWN, M. B. CAMPBELL, N. B. STONER, and I. G. MACY (*Jour. Amer. Dietet. Assoc.*, 10 (1934), No. 1, pp. 29-39).—Beneficial results are reported in gains in weight, anorexia, and constipation following the ingestion of 3 g of nonfermenting yeast daily over a long period of time by a group of women and children who were living on diets conspicuously low in fruits, vegetables, and whole-grain cereals.

A group of 84 children between the ages of 2 mo. and 14 yr. gained an average of 0.23 lb. per week over a mean 12.7-week period as compared with an expected gain of 0.12 lb. per week and with an average gain of 0.15 lb. per week of 78 children of the same age in a control group receiving no yeast. Improved appetite within 2 or 3 weeks after beginning to take the yeast was reported by 108 out of 120 individuals complaining of poor appetite, and improved bowel function in 94 out of 113 subjects suffering from constipation. There were some indications that yeast was of value in pregnancy and lactation. In no case was there any complaint of gastro-intestinal upsets or evidence of skin eruptions as a result of the yeast.

The nutritive value of animal tissues in growth, reproduction, and lactation, I, II, H. G. SMITH and W. H. SEEGERs (*Jour. Nutrition*, 7 (1934), No. 2, pp. 195-207, 209-219, figs. 2).—Two papers are presented.

I. Alcohol-extracted beef liver.—Experiments are reported in which alcohol-extracted liver was fed to rats at 15 and 20 percent levels as the source of protein in synthetic rations presumably adequate in all other respects.

In the first generation growth was distinctly subnormal at the 15 percent level and normal at the 20 percent level. All of the females were fertile, but there was considerable difficulty in mating. The litters were normal at birth, but lactation was not entirely satisfactory. In the second generation, growth

was below normal on both levels of protein, reproduction was abnormal, and lactation was a failure.

"Supplementary feeding of dried whole liver increased the growth rate of first and second generation animals. Raw liver supplements enabled the females to lactate and led to the weaning of more vigorous young, to better growth in the two succeeding generations, and to partial success in lactation in the third generation. The reproductive mechanism was seriously deranged on these alcohol-extracted liver rations, as evidenced by irregular cycles and failure to mate at estrus."

II. *The presence of a new dietary principle in liver.*—A further comparison of alcohol-extracted liver and dried whole liver was made by feeding each at the same level to comparable groups of rats on rations considered satisfactory in other respects than protein. A third group received the alcohol-extracted liver supplemented with 0.5 g daily of raw liver.

Differences in the growth response on the whole liver were noticeable almost immediately, particularly in the male animals. After about 50 days the animals receiving the whole raw liver as a supplement to the alcohol-extracted liver did not continue to grow as rapidly, showing that the amount fed, 0.5 g daily, carried an insufficient amount of the growth factor. Again reproduction was less satisfactory on the alcohol-extracted liver than on the whole liver. The mortality of the young was even higher than in the earlier study, and lactation was a complete failure.

The evidence is considered convincing that alcohol extraction removes something from liver which is necessary for optimum growth and lactation. It was demonstrated that this active material is not associated with the liver lipoids, that it is probably not identical with any of the B vitamins as present in yeast or with any of the other hitherto known dietary essentials, and that it may be identical with the factor provisionally named physin by Mapson (E. S. R., 68, p. 860).

"Physiologically improper proportions of the accepted dietary requisites are known to produce nutritional abnormalities, and this new factor may yet prove to be a hypothetical substance, but the failure to obtain optimum growth and lactation on extracted-liver rations, when the known requirements are supplied in abundance, presents a contrast to the relatively small amount of whole liver which will restore these functions to normal."

The effect of acid ash and alkaline ash foodstuffs on the acid-base equilibrium of man, F. BISCHOFF, W. D. SANBURN, M. L. LONG, and M. M. DEWAR (*Jour. Nutrition*, 7 (1934), No. 1, pp. 51-65).—This study was concerned with the possibility of producing (1) a sustained shift or (2) a temporary shift in the acid-base equilibrium of the blood following the ingestion of acid-ash or alkaline-ash foodstuffs.

It was first found that 30 g daily of sodium citrate was the smallest amount of alkali which would produce a shift in the acid-base equilibrium of the blood drawn before breakfast outside the normal variation of the individual but inside the normal variation of a normal group. This amount was administered daily for 40 days, during which time three blood samples were collected for determinations of total plasma bicarbonate and pH. The values for both were within the normal range, although during the final period there was a slight rise in plasma CO₂ and in two of the tests a very slight rise in pH.

The subject was then kept for 6, 9, and 9 days on his regular diet, an alkaline-ash diet, and an acid-ash diet, respectively, with two or three determinations in each period of plasma pH and CO₂. The urine was also tested for pH and titratable acidity. During the first and third periods the urinary pH values

were both on the acid side, 5.8 ± 0.15 and 5.9 ± 0.12 , respectively. On the basic diet the values shifted to 6.9 ± 0.15 . The titratable acidity values showed similar changes, but no changes in the pH or CO_2 of the plasma outside the normal variations were observed.

In an even more drastic experiment, the same subject was placed on an acid-ash diet containing the acid ash equivalent of 3 lb. of beef. No significant change in blood pH resulted after 2 days on this diet, but there was a 1 millimol drop in plasma CO_2 .

In the second part of the study the ingestion of 1 qt. of milk, 1 qt. of orange juice, or 1 lb. of bananas produced no temporary shift in the plasma pH or alkali reserve in four subjects. The ingestion of 1 lb. of steak temporarily lowered the plasma bicarbonate significantly in one of the four individuals studied, but the absolute values were well within the group range.

Cutaneous blood-sugar curves after the administration of fructose, mannose, and xylose, V. J. HARDING, T. F. NICHOLSON, and A. R. ARMSTRONG (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2035-2042, figs. 3).—Use has been made of the *Proteus vulgaris* method of Harding and Nicholson (*E. S. R.*, 72, p. 157) for the separation of glucose from fructose or mannose in small amounts of blood to determine the effect of the ingestion of these sugars on blood sugar values. Normal male subjects fasted from 6 p. m. to the next morning and, after emptying the bladder at 9 a. m., consumed the desired amount of the sugar (fructose, mannose, xylose, and galactose) dissolved in 400 cc of water. Finger blood samples were taken every 5 min. during the first hour and at 30-min. intervals during the second hour, at the end of which the urine was collected for examination.

An increase in blood glucose could be detected after the administration of fructose or galactose but not after mannose or xylose. Small concentrations of fructose and large of xylose were detected in the blood and urine, and mannose was detected in the urine but not in the blood.

"It is suggested that the hyperglycemias following the ingestion of fructose and galactose are the results of the production of a glucose precursor. Any foreign sugar, however, if its blood concentration is sufficiently great, may produce a hyperglycemia."

Effect of varying sugar intake on nitrogen, calcium, and phosphorus retention of children, R. B. HUBBELL and M. KOEHNE (*Amer. Jour. Diseases Children*, 47 (1934), No. 5, pp. 988-992).—In connection with the investigation of Bunting and his associates of factors concerned in dental caries noted on page 733, the authors, with the assistance of E. Morrell and B. Prytz, determined the retentions of nitrogen, calcium, and phosphorus on diets of differing sugar content during 35 7-day periods by 17 girls from 7 to 11 yr. of age, chosen from the group previously described by Koehne and Morrell (*E. S. R.*, 71, p. 877).

In 23 periods on a diet low in sugar content, the average retentions were nitrogen 0.026, calcium 0.005, and phosphorus 0.007 g per kilogram per day. In 5 periods with the diet modified by the inclusion of enough sugar to give a 6-percent increase in calorie value, there were no significant changes in the retention of any of these elements, but in 7 periods with the sugar content of the diet increased to the extent of raising the calorie value by from 16 to 18 percent there was a tendency toward increased retention of nitrogen and phosphorus and, in 5 of the 7 cases, a decreased retention of calcium. The loss of calcium in every case was through the urine and not the feces, indicating that excess sugar did not cause a digestive disturbance.

The iron content of foods used in a municipal hospital, V. TOSCANI and P. REZNIKOFF (*Jour. Nutrition*, 7 (1934), No. 1, pp. 79-87).—Iron analyses by

the Elvehjem modification of the Kennedy procedure are reported for 53 common foodstuffs used in a municipal hospital. In most cases at least three specimens of the food, sampled at different times, were analyzed. The data are reported in maximum, minimum, and average values in terms of milligrams per 100 g edible portion, together with values for the same items as reported in the literature. The values are also recalculated in terms of milligrams of iron in an average portion of the food. For further comparison a table is given listing foods in which the variations from maximum to minimum values for iron content of different specimens of the same foods are within 25 percent, from 26 to 50, from 51 to 100, and 100 percent or more. The foods are also arranged in descending order of absolute iron content, and in iron content of an average portion, respectively.

Iron metabolism studies in a normal subject and in a polycythemic patient, P. REZNIKOFF, V. TOSCANI, and R. FULLARTON (*Jour. Nutrition*, 7 (1934), No. 2, pp. 221-230, figs. 2).—The metabolism studies reported were conducted over a period of 7 mo., during which aliquot portions of all foods consumed were analyzed for iron, as described by Toscani and Reznikoff in the paper noted above. The urine and stools were collected quantitatively and analyzed by 4-day periods. Red blood cell counts and hemoglobin determinations were made twice a week. The subjects were both adult males.

The normal subject had a positive balance of more than 5 mg of iron daily on an intake of about 26 mg. Following parenteral therapy with a liver extract potent in causing remissions in pernicious anemia, the iron retention was increased to 13 mg daily, and remained at about 8 mg after the intake had been reduced to 19 mg. On an intake of 10 mg the subject was practically in iron balance without parenteral liver therapy and had a retention of almost 3 mg daily on the same intake with the therapy. After the effects of the therapy had subsided, the subject was again in balance on a 10 mg intake and stored about 2.5 mg daily on an intake of 17 mg.

On a high iron intake, 17 mg in food and 60 mg in a liver fraction potent for secondary anemia, the subject showed a retention of 17 mg daily, but when given the same amount of iron in food alone the retention was only 6.5 mg. The administration of parenteral liver extract, together with high iron intake, resulted in a marked increase in iron excretion, which was checked somewhat by the administration of copper sulfate.

The red cell and hemoglobin figures showed at first very little relation to iron intake, but with adequate intake, 20 mg daily, a count of about 5,000,000 and hemoglobin values of from 85 to 100 percent were obtained. Subsequent shifts in iron intake were followed by corresponding shifts in red cells and hemoglobin. The final count of 5,000,000 red blood cells and 96 percent hemoglobin, compared with the initial count and total retention of iron, showed that not all of the iron retained had been converted into hemoglobin.

The polycythemic patient, during a remission stage, was on a slightly positive iron balance when his intake varied from 14 to 18 mg daily. Following periods of intensive X-ray or phenylhydrazine treatment, there were marked decreases in the red blood cells and hemoglobin, but these were accompanied by no marked increase in iron excretion. This is thought to indicate that the great bulk of the iron thus liberated was stored in the body.

Attention is called to the remarkable constancy in the amount of iron excreted per gram of dried stool in both the normal and polycythemic subject except when large amounts of iron were given. Minimum, maximum, and average values for the normal subject on an intake of from 10 to 25 mg were 0.36, 0.82, and 0.6 mg, respectively, and for the polycythemic patient throughout

the experiment 0.32, 0.78, and 0.51 mg, respectively. Corresponding figures for the excretion of iron in the urine were 0.2, 0.62, and 0.35 mg for the normal and 0.24, 0.74, and 0.42 mg for the polycythemic subject.

Effects of fluorine upon rate of eruption of rat incisors, and its correlation with bone development and body growth, M. C. SMITH (*Jour. Dental Res.*, 14 (1934), No. 2, pp. 139-144, fig. 1).—As a part of the extensive investigation of the harmful effects of fluorine upon the teeth (E. S. R., 70, p. 887), a special study was made of the eruption rates of the lower incisor teeth of rats fed sodium fluoride at levels of 0.05 and 0.1 percent of the diet, which was the same as in the earlier studies. The rates of eruption were determined weekly for a period of 10 weeks by measuring with an adjustable caliper the distance between the gingival line and a scratch on the tooth made at the gingival line the previous week. Comparisons were also made of the growth of the rats in the three groups and of the calcium and phosphorus retentions.

The average rates of eruption of the teeth of the rats during the 10-week period were 31.7 mm for the controls and 27.7 and 16.8 mm for the rats on rations containing 0.05 and 0.1 percent of sodium fluoride, respectively.

The sodium fluoride was also found to retard the rate of body growth and to lower the retention of calcium and phosphorus. On the ration containing the lower concentration of sodium fluoride, the rate of body growth, the quantities of Ca and of P retained, and the rate of eruption of the incisors were 84.1, 85.9, 84.3, and 87.3 percent, respectively, of the corresponding values for the control rats. At the higher level of fluorine feeding the corresponding values were 39.8, 44.2, 47.8, and 52.9 percent, respectively.

Effect of various amounts of sodium fluoride on the teeth of white rats, H. T. DEAN, W. H. SEBRELL, R. P. BREAUX, and E. ELVOVE (*Pub. Health Rpts.* [U. S.], 49 (1934), No. 37, pp. 1075-1081, pls. 2, fig. 1).—In continuation of the investigation noted previously (E. S. R., 70, p. 572), changes in the teeth of white rats were produced within 23 days by drinking water containing as little as 25 p. p. m. of sodium fluoride. The changes were in the form of fine transverse striations visible at first only with the aid of a hand lens. When the amount of sodium fluoride was increased to 150 p. p. m. the striations merged into irregular brown patches. At a concentration of 300 p. p. m. there was a loss of pigment and the teeth became creamy in color and brittle. At 500 p. p. m. the surviving animals had white, chalky, brittle incisors which fractured readily and showed no brown striations.

The addition of 5 percent calcium carbonate to the diet caused no appreciable change in the appearance of the teeth of rats on 50, 150, and 500 p. p. m. of sodium fluoride in the drinking water.

Ocular disturbances produced in experimental animals by dietary changes: Clinical implications, A. M. YUDKIN (*Jour. Amer. Med. Assoc.*, 101 (1933), No. 12, pp. 921-926).—This paper, read before the section on ophthalmology at the 1933 meeting of the American Medical Association, discusses the possible relationship between lack of vitamin A and retinal disturbances such as night blindness, lack of vitamin G and cataract, and mineral deficiencies and glaucoma. Evidence in the literature and from laboratory (E. S. R., 66, p. 691) and clinical observations by the author is summarized, leading to the conclusion that diseases of the retina involving the pigment and neuro-epithelial layers were benefited by the administration of vitamin A, that "further evidence of a more exacting character is necessary to establish the apparent association of a deficiency in vitamin G and cataract formation", and that a low salt diet does not produce simple glaucoma but a more intricate syndrome.

Hitherto unreported laboratory studies include tests showing the value of hog and steer retinas as sources of vitamin A and a repetition by Guida and the author of studies of Day, Langston, and O'Brien, on the production of cataract in rats on a G-deficient diet. In the latter study the rats on the G-deficient diet showed the first symptoms of opacity of the lens at the end of 10 weeks. In 1 animal which was given vitamin G as soon as the first signs of opacity appeared, all signs of cataract disappeared within 3 weeks. In the other 5 the changes in the lens developed completely in 7 days, and there was no clearing after later additions of yeast sufficient to restore normal nutrition. In another series of older rats which had been stunted in growth by suboptimal amounts of yeast as the source of vitamin G, no changes in the eyes were evident at the end of 12 weeks, and in still another group fed a more highly purified diet the animals died before any changes in the lens became evident.

Discussion of the paper by C. S. O'Brien, K. W. Cosgrove, P. L. Day, L. A. Lane, and A. M. Yudkin is appended.

The vitamin B and vitamin G content of Bosc pears: Use of the Munsell method of assaying foods for vitamin G, R. DOUGLASS, M. HALLOWAY, J. C. WILLIAMS, and A. GARRISON (*Jour. Nutrition*, 7 (1934), No. 1, pp. 27-40, figs. 2).—The Oregon-grown Bosc pears used in this study were harvested and stored at a temperature of 32° F., ripened in 6 days at a temperature of 60°-68°, dried in about 64 hr. at an average temperature of 160° in a tunnel recirculating prune drier, sealed in No. 2½ cans, and opened only for immediate use. Determinations were made of the content of vitamin B complex, of vitamin B (using autoclaved yeast as the source of vitamin G), and of vitamin G, with white corn as the source of vitamin B, following the technic of Munsell (*E. S. R.*, 66, p. 596). The values obtained for vitamins B and G are summarized as follows:

"As a source of vitamin B, 0.73 g dried Bosc pear (6.0 g fresh pear) furnishes 1 unit of vitamin B, or 1 oz. fresh pear furnishes 4.7 units of vitamin B. As a source of vitamin G, 0.59 g of dried pears (4.64 g of fresh pear) contains 1 unit of vitamin G, or 1 oz. of fresh pear furnishes 6.1 units of vitamin G. It appears, therefore, that Bosc pears are a somewhat richer source of vitamin G than vitamin B."

From their experience the authors conclude that, "in laboratories not equipped to prepare extracts of vitamin B for use in the assaying of foods for vitamin G, fairly satisfactory results may be obtained by use of the Munsell method in which white corn furnishes the vitamin B."

Human milk studies, XII, XIII (*Jour. Nutrition*, 7 (1934), Nos. 2, pp. 231-249, figs. 2; 3, pp. 331-336).—A continuation of the investigation noted previously (*E. S. R.*, 67, p. 624).

XII.—The vitamin B and vitamin G content before and during maternal consumption of yeast, E. G. Donelson and I. G. Macy.—A study was made of the effectiveness of diets rich in the vitamin B complex on the nutrition of women during lactation and on the biological potency of their milk. As in previous studies of the series, the subjects were women supplying milk for the Mother's Milk Bureau of Detroit. Individual and mixed samples of milk from women with approximately the same milk flow were tested for their vitamin B and G potency before and during additions of 10 g of yeast daily to the customary diet.

As judged by the rat growth method, no increase in the vitamin B content of the breast milk occurred during the yeast feeding, the content remaining

approximately 0.1 unit per cubic centimeter throughout the experimental period. The concentration of vitamin G on the other hand increased from 0.2 unit to 0.3 unit per cubic centimeter during the yeast period.

A comparison of the weekly gains of the test animals with their food consumption confirmed the earlier findings of McCosh, Macy, and Hunscher (E. S. R., 65, p. 398) that the addition of yeast to the maternal diet increases its efficiency, and showed that this was due to its vitamin G content. Nitrogen balance experiments conducted on some of the rats receiving vitamins B and G from breast milk before and after the addition of yeast showed a greater retention during the latter period, and this was likewise found to be due to vitamin G rather than B.

XIII. Vitamin potency as influenced by supplementing the maternal diet with vitamin A. S. S. McCosh, I. G. Macy, H. A. Hunscher, B. N. Erickson, and E. Donelson.—Attempts to increase the vitamin A content of the breast milk of 3 women whose milk production had been studied during the course of this extensive investigation by supplementing the diet with 15 g of cod-liver oil daily were unsuccessful. It is pointed out, however, that these women were on an abundant and well-chosen diet and that mother's milk produced on inadequate dietaries may fall far short of meeting the highest concentration of vitamin A possible. For this reason clinicians "can well afford to see that their nursing mothers receive in their diets a sufficient amount of this important food substance to maintain its maximum values in breast milk and thereby benefit the mother and her child."

Vitamin A and colds (*West Virginia Sta. Bul.* 263 (1934), p. 39).—This progress report (E. S. R., 68, p. 862) summarizes data on the relative incidence and duration of colds in groups of students receiving various rich sources of vitamin A. A preliminary report has been noted from another source (E. S. R., 72, p. 137).

Vitamin A "Vogan" (Merck) in A avitaminosis (keratomalacia) in infants [trans. title, E. WIELAND (*München. Med. Wchnschr.*, 81 (1934), No. 21, pp. 777-780, figs. 4).—A case report is given in illustration of the beneficial effect of a vitamin A concentrate on keratomalacia in a 3-months-old male marasmic twin who had received breast milk feeding for 6 weeks, followed by goat's milk. The infant was suffering from severe anemia as well as keratomalacia in one eye, although its similarly fed twin sister was normally developed and healthy except for a mild anemia.

The administration of the vitamin A concentrate cured the eye condition, but failed to prevent a lung affection. On suspending the vitamin A treatment, both eyes became affected. After the lung affection had subsided, treatment with the concentrate was resumed with subsequent improvement in the eye condition.

The term epithelium-protective vitamin is thought to be more appropriate than anti-infective vitamin to describe vitamin A.

Tuberculosis and the deficiency of vitamin A in the diets of the young children in India. N. K. BASU (*Ztschr. Vitaminforsch.*, 2 (1933), No. 3, pp. 190-193; *Ger., Fr. abs.*, p. 193).—Three groups of 10 guinea pigs each were inoculated with tubercle bacilli. Group 1 then received a diet very deficient in vitamin A, group 2 a diet rich in vitamin A from the beginning of the experiment, and group 3 a diet deficient in vitamin A until the development of tuberculosis and then one rich in vitamin A.

At the end of 3 mo. the mortality in the three groups amounted to 90, 40, and 70 percent, respectively. Another group of guinea pigs, group 4, was fed a diet rich in vitamin A for a month, at the end of which all of the group were

inoculated as in the first series. After a period of 4 mo., the mortality in this group was only 25 percent.

During the course of the experiment the animals in groups 1 and 3 showed loss in weight, decreases in hemoglobin and red blood cells, gradual failure of the appetite, and a rise in body temperature.

A group of 6 children from 5 to 12 yr. of age showing regular symptoms of tuberculosis, including the presence of tubercle bacilli in the sputum, was given treatment with a vitamin A concentrate (amount not stated) combined with a diet rich in vitamin A. After 6 mo. 4 of the children were considered cured. "Though the number of cases was too small to come to definite conclusion, still the value of vitamin A in these cases cannot be overlooked."

Tuberculosis and deficiency of vitamins, N. K. BASU (*Ztschr. Vitaminforsch.*, 3 (1934), No. 2, pp. 91-93; *Ger., Fr. abs.*, p. 93).—In this continuation of the study noted above, similar tests were conducted on guinea pigs to determine the effect of diets deficient only in vitamins B, C, and D, respectively. At the end of 3 mo. the mortality in the various groups of 6 animals each was 90 percent for the group on the diet deficient in vitamins A, B, C, and D, 33 percent on the diet rich in all of the vitamins, 50 percent on the diets deficient in vitamins B and C, respectively, and 66 percent on the diet deficient in vitamin D. The increased susceptibility to tuberculosis brought about by deficiencies in the four vitamins is explained as follows:

The administration of vitamin B helps to prevent anorexia and loss of weight, which are the two most prominent symptoms of the preliminary stages of tuberculosis, vitamin A maintains the integrity of the epithelial tissues and thus helps to prevent the entrance of the bacteria into the system, vitamin C increases the resistance of the tissues against bacterial infection, and vitamin D increases the process of calcification and checks the progress of the disease.

The importance is emphasized of a well-balanced diet with sufficient vitamins as a preventive measure, of attention to appetite and weight, with provision for additional vitamins in extreme cases, and of particular attention to the diet in the stage of actual illness or convalescence.

Lipoids and the B vitamins, I-III [trans. title] (*Bul. Soc. Chim. Biol.*, 15 (1933), No. 10, pp. 1498-1507, figs. 4; 1508-1516, figs. 10; 1517-1519).—Three papers are presented.

I. *Evidence of the role of the B vitamins in the utilization of lipoids by the organism*, R. Lecoq.—Pigeons were fed one or another of diets containing meat peptone or purified muscle in quantities of 25 and 50 percent of a diet otherwise consisting of butterfat 6, Osborne and Mendel salt mixture 6, agar 10, filter paper and paraffin 5, and olive oil 48 and 23 percent for the diets containing 25 and 50 percent of the protein, respectively. The diets were fed in 15 g daily amounts with and without 0.75 g of dried yeast as the source of the B vitamins.

On the vitamin B-deficient diets the survival period with peptone as the source of protein, from 20 to 35 days, was unaffected by the amount of fat in the diet, but when muscle powder was used the survival period was from 30 to 50 days on the high-fat and from 70 to 100 days on the low-fat diet. The prolongation of the survival period is attributed to the fact that the muscle powder is digested more slowly than the peptone. Protection was secured by the addition of yeast to all of the diets.

II. *Influence of the constitution of the lipoids on the evolution of avitaminosis B in the pigeon. Generality of the need of the B vitamins in the utilization of lipoids*, R. Lecoq and J. Savare.—Various fats were fed to pigeons as 50 percent of a vitamin B-free diet similar to the one in the previous

study with 25 percent of peptone as the protein. The various oils arranged in order of increasing survival periods were castor oil and olive oil with a survival period of from 20 to 35 days, peanut oil 25 to 40, linseed oil 35 to 50, and cod-liver oil 40 to 55 days. On the diets containing fats the results were hardened cod-liver oil 15 to 30, lard 25 to 40, and cocoa butter and palm oil from 30 to 45 days each. As in the case of the protein in the previous study, the survival periods appeared to be increased with the decreased digestibility of the fats. It is thought that the nonsaturated fatty acids in the oils and the stearic acid in the solid fats were responsible for the retardation of the symptoms of avitaminosis. With the exception of diets containing castor oil, the addition of vitamin B prevented or cured polyneuritis on the fat rich diets.

III. *Are alcohol-water soluble B vitamins equally fat soluble?* J. Savare.—Contrary to earlier observations by Myers and Voegtlin (E. S. R., 43, p. 459), the alcohol-water soluble B vitamins from yeast were found to be insoluble in olive oil.

The effect of vitamin B₁ upon the respiratory quotient of brain tissue, H. M. SINCLAIR (*Biochem. Jour.*, 27 (1933), No. 6, pp. 1927–1934).—Data are reported on the respiration of brain tissues from normal, rice-fed but not polyneuritic, and polyneuritic pigeons in the presence of lactate buffered with either phosphate or bicarbonate and with and without the addition of minute amounts of crystalline vitamin B₁.

The respiratory quotient of the tissues from polyneuritic pigeons was low and was raised nearly to normal by the addition of vitamin B₁, although this addition had no effect on the respiratory quotient of normal tissue and scarcely any effect on that of the tissues from pigeons fed polished rice but showing no symptoms. "The specific effect of vitamin B₁ in raising the respiration of avitaminous brain tissue is found in lactate buffered with bicarbonate, and there is also a rise in the respiratory quotient. These results are independent of the addition of inorganic phosphate to the medium. The aerobic glycolysis of the avitaminous tissue is slightly negative and becomes more so when vitamin B₁ is added or with normal tissue. The addition of phosphate markedly increases this negative value."

Further experiments with cataract in albino rats resulting from the withdrawal of vitamin G (B₂) from the diet, P. L. DAY and W. C. LANGSTON (*Jour. Nutrition*, 7 (1934), No. 1, pp. 97–106, figs. 2).—In all but 2 of 83 rats fed one or another of four diets deficient in vitamin G, cataract developed after varying lengths of time. On one of the diets, which contained 25 percent whole wheat, and therefore, a limited quantity of vitamin G, there was greater growth, later appearance of cataract, and longer survival. "It thus appears that in the diets used the growth-limiting and cataract-preventive factors are identical, or else these diets are similarly deficient in both. Cataract is suggested as a better criterion of vitamin G deficiency than dermatitis, as its appearance is more consistent and unmistakable, and also as its development is not influenced by external irritations and bacterial invasion which are undoubtedly contributing factors in the development of dermatitis."

Behavior of rats of different ages on a vitamin G deficient diet, E. P. DANIEL and H. E. MUNSELL (*Jour. Nutrition*, 7 (1934), No. 2, pp. 117–130, figs. 4).—This contribution from the Bureau of Home Economics, U. S. D. A., reports a series of experiments carried out to obtain additional knowledge concerning the behavior of rats of different ages and both sexes on a diet deficient but not completely lacking in vitamin G, the Sherman-Spohn basal diet supplemented with 0.25 g of rice polish daily. The plan of the investigation

consisted in placing a certain number of rats on the experimental diet at the ages of 4, 6, 8, 10, and 12 weeks and 6, 9, 12, 15, and 18 mo. The animals from a given litter were spread as far as possible through the different age groups. The criteria used for comparing the behavior of the different age groups on the vitamin G-deficient diet were the ability of the young to grow and the older ones to maintain weight, the survival period for each group, and the gross autopsy findings.

The 4-week-old animals were able to gain a little during the first 3 mo. and then maintained their weight for the remainder of the year, while the 6-week-old animals maintained their original weight with little variation for over a year. All of the others lost weight from the beginning, and the older the animals up to 6 mo. the more rapid was this loss. Beyond this age the losses in weight were similar for the different age groups until a certain low weight level was reached, characteristic for each group, after which nearly constant weight was maintained.

The younger animals survived longer than the older, but all died before the normal life span had been covered. The gross findings on autopsy were similar for all age groups except for a tendency toward marked alopecia in the younger animals. Next to loss in weight, loss of hair and dermatitis were the earliest symptoms. The skin lesions occurred more frequently about the head, shoulders, and legs, but were not bilaterally symmetrical. Other symptoms noted were incontinence of the urine, which was highly pigmented and in the later stages bloody, priapism, hair balls in the stomach, and atrophy of the testes.

There were no marked differences between the sexes beyond greater actual weight losses in the males and a tendency toward a more rapid decline in weight in the younger males than in the females of the same age. No seasonal variation could be noted in the development of symptoms.

The indophenol-reducing capacity and the vitamin C content of extracts of young germinated peas, S. W. JOHNSON (*Biochem. Jour.*, 27 (1933), No. 6, pp. 1942-1949, fig. 1).—Evidence is presented showing that the indophenol-reducing capacity of extracts prepared with various solvents from dried peas which had been germinated for 3 days had no quantitative relationship to the antiscorbutic properties, as determined biologically, of the seedlings from which the extracts were obtained. All of the extracts were considered to contain at least one substance other than ascorbic acid capable of producing indophenol. The lower biological activity of the extracts than of the seedlings from which they were prepared is attributed to incomplete extraction of the vitamin. "This, incidentally, shows the ease with which misleading results may accrue from testing extracts instead of tissues."

Vitamin C in the suprarenal medulla, L. J. HARRIS and S. N. RAY (*Biochem. Jour.*, 27 (1933), No. 6, pp. 2006-2010, figs. 2).—Using the histological tooth structure method, as described in earlier papers (E. S. R., 69, p. 904), the authors compared the antiscorbutic activity of ox suprarenal medulla and orange juice and found that 1 g of the medulla had the same biological activity as 1.9 cc of orange juice. Almost identical results were obtained in a comparison of the two substances by chemical titration. This is thought to indicate that, contrary to conclusions drawn from the negative results obtained with the silver nitrate reducing test, the medulla, as well as the cortex, of the adrenal gland, is a rich source of vitamin C. "Our results indicate that ox suprarenal cortex has an activity of about 30 international units per gram and ox medulla of about 20 units, i. e., no less than two-thirds of the former. In other words, the cortex has about thrice and the medulla about twice

the potency of fresh orange juice or lemon juice (the international standard of vitamin C activity)."

The significance of the high concentration of vitamin C in the adrenal gland is discussed. The theory that it serves as a reserve store of vitamin C is considered untenable because (1) the total content of vitamin C in the adrenal of the guinea pig is not more than 0.5 mg, an amount insufficient to provide for the vitamin C needs of the body for more than 24 hr., (2) the amount does not rise significantly above normal limits after the ingestion of extra amounts, and (3) the vitamin does not disappear from the gland during the early stages of deficiency or entirely after prolonged deficiency.

The theory expressed in an earlier paper (E. S. R., 70, p. 741) that one function of the adrenal gland is to synthesize vitamin C in certain species was tested on rats by submitting them to adrenalectomy and feeding them on a vitamin C-free diet. Symptoms of vitamin C deficiency did not follow. The adrenal gland of the rat was found to contain about 3 times as much vitamin C, as determined by curative tests on guinea pigs, as that of the ox or normal guinea pig and consequently to be about 10 times as rich in vitamin C as orange juice.

The probability is suggested that the large amounts of vitamin C in the adrenals "are involved in a system needed to maintain adrenaline-like substances in a reduced condition."

The influence of ascorbic acid on gaseous metabolism in the normal guinea pig and in the guinea pig on a scorbutic diet [trans. title], M. CALCINAI and D. GALIGANI (*Biochim. e Terapia Sper.*, 21 (1934), No. 6, pp. 227-232).—The oxygen consumption of scorbutic guinea pigs was found to be from 15 to 20 percent higher than that of normal guinea pigs. The intraperitoneal injection of ascorbic acid caused a slight increase in oxygen consumption in normal animals and a decrease in scorbutic animals.

The antiscorbutic action of the adrenal cortex of the ox [trans. title], R. DEOTTO (*Ztschr. Vitaminforsch.*, 2 (1933), No. 3, pp. 182-190, figs. 2; *Ger., Fr., Eng. abs.*, pp. 189, 190).—Daily administration by mouth of 2 cc of a 1:3 aqueous extract of the adrenal cortex of the ox to guinea pigs on a scorbutic diet afforded complete protection against scurvy, while the same dose of a similar extract of ox liver was without effect. The adrenal extract was ineffective on subcutaneous injection, partly because of a local irritating effect which prevented the use of sufficient amounts of the extract. Pure adrenalin was without effect as an antiscorbutic.

The antiscorbutic action of aqueous humor [trans. title], H. KAWACHI (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 225 (1934), No. 5-6, pp. 273, 274, fig. 1).—The aqueous humor of ox eyes was found to protect guinea pigs against scurvy in doses of 5 cc daily. On titration with 2,6-dichlorophenolindophenol, aqueous humor was found to contain 0.211 mg of ascorbic acid per cubic centimeter. Consequently the need of the guinea pig for vitamin C is calculated to be 1 mg per animal per day.

Attention is called to the presence of an osazone in aqueous humor which differs from other osazones in its solubility in dilute carbonate solution. This is thought to be the osazone of vitamin C.

The sterols of rice embryos.—II, Ergosterol and vitamin D [trans. title], K. TANAKA (*Jour. Biochem.*, 18 (1933), No. 1, pp. 1-13, figs. 8).—The unsaponifiable fraction of oil from rice embryo, as well as irradiated mixed sterols from the embryo, was found to have preventive and curative properties for rats on the McCollum rickets-producing diet 3143. The unsaponifiable frac-

tion of the oil was fed in quantities of from 0.3 to 0.5 mg daily during a period of 30 days in preventive and 47 days in curative tests. In both instances growth was good.

A review of recent studies of the cause of dental caries, M. KOEHNE, R. W. BUNTING, and F. P. HADLEY (*Jour. Amer. Dietet. Assoc.*, 9 (1934), No. 6, pp. 445-461).—A review of the literature, with special emphasis on the investigations carried on under the direction of Bunting which have been noted from other sources (*E. S. R.*, 70, pp. 571, 887). A bibliography of 60 titles is appended.

TEXTILES AND CLOTHING

[Wool research at the Wyoming Station] (*Wyoming Sta. Rpt. 1934*, pp. 26, 27, 28).—Experiments reviewed briefly included studies of duplicate samples and large and small samples for shrinkage determination and the relation between shrinkage and the weight of a given volume of wool under compression; a comparison of wool bags woven from paper twine v. ordinary jute; and tests of branding paint.

A comparison of methods for determining the absorption of water by fabrics, K. HESS and D. READHIMER (*Jour. Home Econ.*, 26 (1934), No. 5, pp. 298-303, figs. 5).—In this contribution from the Kansas Experiment Station, a comparison is reported of several methods of determining the water absorption of fabrics. These included the eosin dye and wet surface methods as described by L. Stevenson and M. Lindsay³ and a method described by G. B. Haven⁴ in which 1-in. strips of the fabric are placed over an illuminated table so that the rate of absorption may be observed.

With slight changes in technic, which are described, the Haven method proved to be comparatively accurate and rapid for turkish toweling, if the work was done under controlled atmospheric conditions, but was unsuitable for knit underwear fabrics. For this material the wet surface method, with certain modifications, proved satisfactory. With precautions to prevent the exposure of the moisture-free fabric to the atmosphere, this test can be performed in a laboratory in which constant relative humidity and temperature are not maintained.

Clothing purchased by farm families in Tompkins County, New York, 1927-28, B. BLACKMORE ([*New York Cornell Sta. Bul.* 615 (1934), pp. 44).—This bulletin reports an analysis of the data obtained on purchases of clothing and household linens by farm families taking part in the household management survey, other phases of which have been reported previously (*E. S. R.*, 70, p. 561). The estimates of expenditures for clothing for various members of the family were obtained from the homemaker by the use of a list which contained practically all articles of clothing customarily purchased by farm families. The total expenditures for clothing were analyzed in relation to numbers dependent on the family income for clothing, the age of the homemaker, and the family income and capital. Separate analyses were also made of the clothing expenditures of the homemakers, the operators, the daughters, and the sons in relation to various factors. Other topics discussed included expenditures for infants' clothing, variability in the prices paid for like articles of clothing, wear in clothing, reasons for purchasing ready-made clothing or making it at home, time spent by housewives in sewing, mending, and caring for garments, the selection and planning of the homemaker's wardrobe, and expenditures for household linens.

³ *Jour. Home Econ.*, 18 (1926), No. 4, pp. 193-198.

⁴ *Amer. Dyestuff Rptr.*, 19 (1930), No. 21, pp. 757-761, 782-785, figs. 20.

In the families studied, the expenditures for clothing averaged about 20 percent of the total cash household expenditures. The actual expenditures ranged from \$9 to \$690, with an average of \$165 per family per year. As the average number of persons dependent on the family income for clothing was 3.6, the actual average expenditure for clothing per person was small. The expenditure for household linens for the year was also very small, averaging only \$12.

About 30 percent of the total expenditures for clothing was spent for the operators and practically the same percentage for the homemakers. As the number dependent on the family income for clothing increased, the homemaker spent a decreasing amount for her clothing. Older sons and daughters spent relatively more than the operator or homemaker. "Higher income and capital were expressed more clearly in the women's clothing than in the men's, and in the clothing for the older daughters than in that for other members of the family. Financial ability made little difference in the buying of work clothing, but more of the families who were better able financially to do so were buying dress clothing."

The outstanding reasons given for buying clothing ready-made were saving of time, inability to sew, and dislike of sewing, and for making clothing at home economy, the possibility of obtaining better fitting clothing, and a wider choice in design. Nearly half of the women estimated that they spent 2 hr. or less a week in sewing, mending, or caring for garments, and nearly one-fifth of the number spent 6 hr. or more a week in this way. The average time spent was 3.5 hr. per week.

The families in general had no definite plans for clothing expenditures by the year or season, but bought clothing when it was needed and when cash was available to pay for it.

HOME MANAGEMENT AND EQUIPMENT

Heat economy and comfort in the home as influenced by heating methods and building construction, F. L. LAWTON (*Engin. Jour.*, 17 (1934), No. 11, pp. 482-493, figs. 14).—A large amount of data from various sources is presented relating to economy and comfort as influenced by heating methods and house construction. Special attention is drawn to the value of windows having a southern exposure, weather stripping, and insulation, and to the advantages of hot air, hot water, and steam heating systems when properly installed.

Closets and other storage arrangements for the farm home, M. M. WILSON (*U. S. Dept. Agr., Bur. Home Econ.*, 1934, pp. 40, pls. 77).—This mimeographed publication consists of plans developed in connection with the Federal Farm Housing Survey noted previously (*E. S. R.*, 72, p. 574). The material includes plans, specifications, and working diagrams of closets for wearing apparel and for bedding and linen; bathroom, cleaning, and laundry closets; kitchen storage arrangements and food storage rooms for canned and cured products; dining-room and living-room closets and cupboards or cabinets; sewing closets and trays for sewing and mending materials; farm business storage places; telephone booths or closets; cabinets for firearms and fishing equipment; and closets for trunks, furniture, firewood, and out-of-door equipment.

The source material for the plans includes recommendations from the reports of the President's Conference on Home Building and Ownership and minimum dimensions obtained by the author from 25 representative farm households in the course of the investigation reported in Oregon Station Bulletin 320 (*E. S. R.*, 71, p. 142).

Modernizing the Kansas home, H. E. WICHES (Kans. Engin. Expt. Sta. Bul. 32 (1934), pp. 133, figs. 94).—The purpose of this bulletin is to present information on the modernizing of homes. Data are presented on present-day trends in home design and construction, and on methods of solving the modernizing problem.

Slum clearance and rehousing: The first report of the Council for Research on Housing Construction (London: Council Res. Housing Construct., 1934, pp. 139, [pl. 1], figs. [48]).—This is the first report of the English Council for Research on Housing Construction.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1934, H. A. WALLACE (U. S. Dept. Agr., Sec. Agr. Rpt., 1934, pp. III+119).—In addition to findings noted elsewhere in this issue, data are reported on social and economic aspects of forestry (pp. 76-79), food and drug control (pp. 83-85), reduced costs of fertilizers (pp. 100, 101), weather studies (pp. 105-107), road construction (pp. 107-110), and other projects, including a financial statement.

New facts for California farmers: [Biennial Report of California Station, 1933-34], C. B. HUTCHISON (California Sta. [Bien.] Rpt. 1933-34, pp. VIII+179, pls. 12).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Data are also given on wine making problems and the clarification of wine and wine vinegar.

Fifty-third Annual Report of the New York State Agricultural Experiment Station, [1934], U. P. HEDRICK (New York State Sta. Rpt. 1934, pp. 82).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Aiding West Virginia agriculture through research: Report of the West Virginia Agricultural Experiment Station for the biennium ending June 30, 1934, F. D. FROMME (West Virginia Sta. Bul. 263 (1934), pp. 44, figs. 19).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fourth Annual Report of [Wyoming Station, 1934], J. A. HILL (Wyoming Sta. Rpt. 1934, pp. 55).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Agricultural Research Council for the period July 1931-30th September 1933 (London: Com. Privy Council Organ. and Devlpmt. Agr. Res., 1934, pp. V + 205; rev. in Nature [London], 135 (1934), No. 3402, pp. 45, 46).—This report is discussed editorially on page 578 of this issue.

Reports on the work of agricultural research institutes and on certain other agricultural investigations in the United Kingdom, 1932-1933 ([Gt. Brit.] Min. Agr. and Fisheries, Rpts. Agr. Res. Insts. [etc.], 1932-33, pp. 375).—"This volume outlines the progress of agricultural research carried out with the aid of State funds during the academic year 1932-33 at research institutes and other centers in the United Kingdom."

The National Agricultural Research Bureau: Its scope and work under the Ministry of Industries, National Government of the Republic of China (China Natl. Agr. Res. Bur. Misc. Pub. 1 (1934), pp. 12).—This report is discussed editorially on page 577 of this issue.

NOTES

Georgia Station.—Following the discontinuance of research work with cotton at the U. S. Acclimatization Field Station on James Island, S. C., W. W. Ballard of the Bureau of Plant Industry has been transferred to the station for cooperative work in cotton breeding. C. A. McLendon, field agent for the Bureau in one-variety cotton community work in Georgia and Alabama, has been transferred from Atlanta to the station.

Dorothy Maddox has been appointed nutrition laboratory assistant in the department of home economics to fill the vacancy created by the resignation of Blanche Ethridge.

Iowa College.—Dr. Herman Knapp, vice president and treasurer, died March 22 at the age of 71 yr. A son of Dr. Seaman A. Knapp and born in Poultney, Vt., he was graduated from the college in 1883 and was continuously connected with it thereafter. He had been business manager and treasurer since 1887 and had exercised much influence over its expenditures and policies.

Minnesota Station.—The station is arranging to celebrate on June 14 and 15 the fiftieth anniversary of its establishment by holding a semicentennial meeting and demonstration. It is expected that a historical review of the growth of the station will be given, together with an estimate of its achievements and contributions to science.

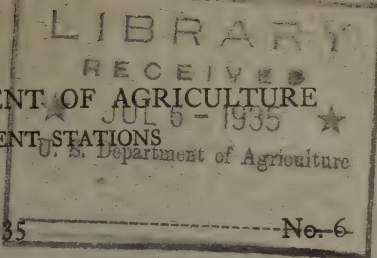
A very successful regional conference on pasture improvement and pasture research was held at the station on March 7 and 8. Representatives from the States of North Dakota, South Dakota, Wisconsin, Iowa, and Minnesota were present and participated in the discussions and committee work, and an informal inter-State advisory committee was set up to assist in developing a program and to evaluate the merits of research projects offered for the region. It is expected that State committees also will be set up for developing State programs of research and in pointing out lines of investigation that are likely to lead to improved pasture plans and pasture management. Through the advisory committee and the State committees it is expected that the research for the region will be coordinated and complemented, State by State, so that the full field may be covered.

Another valuable feature of the conference was a paper on procedure in pasture research read by Dr. E. B. Forbes, director of the Institute of Animal Nutrition, Pennsylvania State College. This was a critical and highly constructive discussion of the necessity for analytical methods in determining pasture crop values and in determining measures of results. Dr. Forbes also contributed a paper on the energy requirements and balances with methods for determination.

Virginia College and Station.—Charles I. Wade, for many years treasurer of the Virginia Polytechnic Institute, died April 6, 1935. During his long service as treasurer, Mr. Wade handled the business of his office with eminent ability and success and with singular devotion to the interests of the institution. J. B. Fogleman, assistant treasurer, has been made acting treasurer.

Wyoming University and Station.—Dr. Fred S. Hultz, head of the department of animal production, has been given leave of absence for 1 yr. beginning January 1, 1935. Dr. J. H. Draize, assistant pharmacologist in the station, has been given leave of absence for 6 mo. beginning February 1 for work in the laboratories of the U. S. War Department.

6R
UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

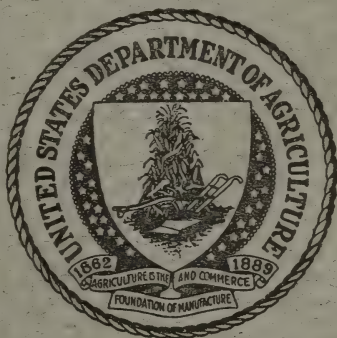


Vol. 72

JUNE 1935

No. 6

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, SYBIL L. SMITH.
 Agricultural Meteorology—W. H. BEAL.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS.
 Genetics—H. M. STEECE, J. W. WELLINGTON, G. HAINES.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology, Veterinary Medicine—W. A. HOOKER.
 Animal Husbandry, Dairying, and Dairy Farming—H. W. MARSTON.
 Agricultural Engineering—R. W. TRULLINGER.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition—SYBIL L. SMITH.
 Textiles and Clothing—H. M. STEECE, SYBIL L. SMITH.
 Home Management and Equipment—
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOL. 72, NO. 6

	Page
Editorial:	
The establishment of the Soil Conservation Service.....	737
Recent work in agricultural science.....	739
Agricultural and biological chemistry.....	739
Agricultural meteorology.....	740
Soils—fertilizers.....	743
Agricultural botany.....	749
Genetics.....	751
Field crops.....	756
Horticulture.....	768
Forestry.....	784
Diseases of plants.....	786
Economic zoology—entomology.....	804
Animal production.....	821
Dairy farming—dairying.....	830
Veterinary medicine.....	836
Agricultural engineering.....	846
Agricultural economics.....	853
Rural sociology.....	864
Agricultural and home economics education.....	865
Foods—human nutrition.....	865
Textiles and clothing.....	893
Home management and equipment.....	894
Miscellaneous.....	894
Notes.....	895

EXPERIMENT STATION RECORD

VOL. 72

JUNE 1935

No. 6

EDITORIAL

THE ESTABLISHMENT OF THE SOIL CONSERVATION SERVICE

An act of Congress approved by President Roosevelt on April 27, 1935, states that "it is hereby recognized that the wastage of soil and moisture resources on farm, grazing, and forest lands of the Nation, resulting from soil erosion, is a menace to the national welfare", and declares it to be the policy of Congress to provide permanently for its control and prevention. The act further empowers the Secretary of Agriculture to coordinate and direct all activities with relation to soil erosion, and he is given specific authority "to conduct surveys, investigations, and research relating to the character of soil erosion and the preventive measures needed, to publish the results of any such surveys, investigations, or research, to disseminate information concerning such methods, and to conduct demonstrational projects in areas subject to erosion by wind or water; to carry out preventive measures, including, but not limited to, engineering operations, methods of cultivation, the growing of vegetation, and changes in use of land; to cooperate or enter into agreements with, or to furnish financial or other aid to, any agency, governmental or otherwise, or any person, subject to such conditions as he may deem necessary, for the purposes of this act; and to acquire lands, or rights or interests therein, by purchase, gift, condemnation, or otherwise."

In order to exercise the powers conferred by this act, the Secretary was directed to establish an agency to be known as the Soil Conservation Service. A memorandum of the same date formally set up this organization, designating as the Chief of the Service Mr. H. H. Bennett, for many years associated with the Soil Survey of the Department and more recently Director of the Soil Erosion Service of the Department of the Interior.

The new organization is to operate as a separate unit of the Department of Agriculture, under direction of the Secretary, and will include soil erosion investigational, service, and control work. The consolidation thereby effected embraces first of all the activities

dealing with the prevention and control of erosion heretofore conducted under the Interior Department. It will also include the soil erosion investigations and regional experiment stations previously conducted by the Bureaus of Chemistry and Soils and Agricultural Engineering in cooperation with the respective State experiment stations, the erosion control nurseries and related activities of the Bureau of Plant Industry, and the Civilian Conservation Corps erosion control work which has been under the immediate supervision of the Forest Service. In general the funds hitherto provided for these various activities are continued by the act, and the extensive allotments under the provisions of the National Industrial Recovery Act are made available until June 30, 1937.

Research into the soil, plant, and engineering aspects of the cause and methods of controlling erosion will continue to be conducted. For this work the facilities are available of the Department's 10 field experiment stations located, respectively, at Bethany, Mo.; Guthrie, Okla.; Hays, Kans.; LaCrosse, Wis.; Clarinda, Iowa; Pullman, Wash.; Statesville, N. C.; Temple, Tex.; Tyler, Tex.; and Zanesville, Ohio. Among the more significant findings thus far revealed by these stations have been those dealing with the value of terracing and the dominating role of vegetation as a controlling factor in soil and water losses.

Using the facts developed by the research under way and in contemplation, large-scale demonstrations will go on in various parts of the country. Under the Soil Erosion Service, 40 such projects in 32 States had been instituted, ranging in size from 50,000 to 16,000,000 acres and covering representative watersheds in the major agricultural sections where erosion has become a problem.

The justification for a comprehensive campaign along these lines becomes evident from a recent estimate that already "more than 50,000,000 acres of land in the United States has been destroyed for crop production by erosion. Another 125,000,000 acres of land new in crops has lost all or most of its topsoil. About 100,000,000 acres is rapidly approaching that condition. At least three-fourths of the farm land of the United States used for clean-tilled crops is subject in varying degrees to erosion, the damage from which to farm lands, roads, reservoirs, irrigation ditches, and valley lands is estimated at more than \$400,000,000 a year." The consolidation and centralization of efforts now possible should be of much assistance in meeting this serious situation promptly and effectively.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Iowa Station researches in bacteriological and food chemistry] (*Iowa Sta. Rpt. 1934*, pp. 63, 81-83).—The report briefly notes work by C. H. Werkman on fermentation products of xylan and on an adaptation and development of the method of partition between solvents for the determination of fermentation products; on the granulation and cloudiness of Iowa honeys, by E. I. Fulmer and O. W. Park; an identification of the water-soluble and the acid-hydrolyzable carbohydrate constituents of the cornstalk, by W. G. Gaessler and R. M. Hixon; and a study of the alcohol yield of corn, oats, barley, and wheat, by Hixon.

Preparation and study of the cereal glutelins [*Nebraska Sta. Rpt. [1933]*, pp. 22, 23].—Results thus far obtained are briefly summarized.

The production of a substance A' in the course of irradiation of vitamin A in solution [trans. title], A. CHEVALLIER, Y. CHORON, and J. GUILLOT (*Compt. Rend. Soc. Biol. [Paris]*, 117 (1934), No. 28, pp. 10-13, figs. 4).—An extension of the investigation noted previously (*E. S. R.*, 72, p. 154) is reported, with the conclusion that in prolonged irradiation of vitamin A in hexane solution a compound A' is formed intermediate between vitamin A and β -ionone. This separates as an insoluble substance from the irradiated product which shows maximum absorption at 3,125 a. u. It is thought that the substance A' corresponds to a state of destruction of the molecule of vitamin A less advanced than that of β -ionone, and that the formation of the latter takes place at the expense of substance A'.

A new colour test for the determination of vitamin A, E. ROSENTHAL and J. ERDÉLYI (*Biochem. Jour.*, 28 (1934), No. 1, pp. 41-44).—The test described is the Carr-Price antimony trichloride reaction modified by the addition of catechol. The oil to be tested is diluted with alcohol-free absolute chloroform, and to from 1 to 2 cc of this solution in a test tube 1 cc of a 0.5 percent solution of catechol in chloroform and from 2 to 3 cc of a cold saturated solution of antimony trichloride in chloroform are added. The test tube containing the mixture is immediately transferred to a water bath at 60° C. for 1 or 2 min. If vitamin A is present an intense violet red color is produced.

Carotene and other carotenoids tested are said to give a blue color and a mixture of carotene and vitamin A a vivid violet color. With ergosterol the test carried out in the cold gives the colors in reverse order, pink slowly changing to blue. With irradiated ergosterol no color is produced.

Directions are given, with illustrative data, for the use of the test in quantitative determinations. The modified test is said to have two advantages, (1) that it makes possible a differentiation of vitamin A from carotenoid substances and (2) that the violet red color is more stable than the blue color obtained in the usual test.

A micromethod for the determination of fatty acids from small amounts of whole blood, M. E. SMITH and M. C. KIK (*Jour. Biol. Chem.*, 103 (1933), No. 2, pp. 391-398; *abs. in Arkansas Sta. Bul. 312* (1934), pp. 38, 39).—According

to a method given trial at the Arkansas Experiment Station, the blood is extracted in a 3:1 alcohol-ether solution, the extract is saponified with saturated potassium hydroxide, and the fatty acids are reprecipitated with dilute sulfuric acid. A departure from previous procedure is made at this point in that the fatty acids are extracted in hot benzene, washed with boiled distilled water in order to free them from traces of inorganic acid, and finally titrated with approximately 0.02 N potassium alcoholate.

The canning of grapefruit and grapefruit juice, A. E. STEVENSON (*Indus. and Engin. Chem.*, 26 (1934), No. 8, pp. 823-825, fig. 1).—A description of the commercial processes of canning grapefruit and grapefruit juice, with a special discussion of the reasons for using plain rather than enamel-lined cans.

Freezing orange juice, J. H. SHRADER and A. H. JOHNSON (*Indus. and Engin. Chem.*, 26 (1934), No. 8, pp. 869-874, figs. 4).—This paper discusses chemical, physical, and bacteriological factors which must be considered in the freezing of orange juice, describes present industrial methods for obtaining and freezing the juice, and discusses factors affecting the quality of the product and marketing experiences.

AGRICULTURAL METEOROLOGY

The importance of phenology for agriculture [trans. title], J. D. KOESLAG (*Landbouwk. Tijdschr. [Amsterdam]*, 46 (1934), No. 558, pp. 230-241, figs. 2; *abs. in Deut. Landw. Rundschau*, 11 (1934), No. 12, p. 826).—The importance of phenological observations in correlating weather and climate with growth of various crops, especially rye, is emphasized, and the organization of a phenological service in the Netherlands is suggested.

Solar and economic relationships, C. GARCIA-MATA and F. I. SHAFFNER (*Quart. Jour. Econ.*, 49 (1934), No. 1, pp. 1-51, figs. 12).—This is a preliminary report on an attempt to establish a factual basis for Jevons' hypothesis concerning business cycles and sun spots, namely, "that the variation in the number of sun spots produced corresponding variations in crops and that through this channel business cycles were brought about." A high correlation was obtained between solar and economic curves. It is stated, however, that "the value of the high correlations obtained depends upon the proof of the validity of a direct causal relation between solar and human activity", and that the results reported in this paper are not considered in any sense final.

The critical period of corn in northeastern Kansas, A. D. ROBB (*U. S. Mo. Weather Rev.*, 62 (1934), No. 8, pp. 286-289, figs. 2).—The conclusions reached in this study were that the tasseling period, about July 14, is the critical point in the life of the corn plant in northeastern Kansas, and that 2.5 in. or more of rain near this time meets the requirements for a good crop. Corn planted before May 4 usually reaches the critical period before dry weather begins, in the latter part of July.

Dew as a factor of plant growth [trans. title], E. LEICK (*Ber. Deut. Bot. Gesell.*, 51 (1933), No. 10, pp. 409-442, figs. 15; *abs. in Deut. Landw. Rundschau*, 11 (1934), No. 12, p. 826).—This study gave results indicating that dew may, under certain conditions, play an important part in furnishing moisture to plants, mainly through direct absorption and to a less extent through the soil. The intensity of dew absorption appears to depend upon the nature of the plant surface and the height above the soil. The use in such studies of a so-called dew plate made of kieselguhr and alabaster gypsum for measuring dew absorption among the growing plants is explained.

Light showers and dew as a source of moisture for the cane plant, H. A. WADSWORTH (*Hawaii. Planters' Rec.*, 38 (1934), No. 4, pp. 257-264).—This paper summarizes a long series of observations and experiments in Hawaii which indicate "an amazing capacity of the cane plant to absorb water through its aerial parts." Further study of the subject is contemplated.

The record-breaking drought, heat, and dust storms of 1934, L. H. BLOCK (*Bul. Amer. Met. Soc.*, 15 (1934), No. 12, pp. 300-307).—This article summarizes observations and conclusions by the author and from various other authentic sources on the unprecedented and disastrous drought, heat, and dust storms east of the Rocky Mountains in 1934, dealing especially with extent of the drought zone, unusually high temperatures, dust storms, late spring rains, insect pests, effect on cattle and native vegetation, depletion of seed stock, low water levels, forest fires, proposed shelter belt, glacial recession, human life and health, and emergency relief.

The cartographic study of drought, W. R. BALDWIN-WISEMAN (*Quart. Jour. Roy. Met. Soc. [London]*, 60 (1934), No. 257, pp. 523-532, figs. 2).—This paper gives the results of a study of the Queensland drought of 1902, which was the most severe on record, by a cartographic method which was briefly as follows: "The differences of the cumulative rainfalls of the drought period for each month, and the cumulative mean monthly rainfalls for the same period at each station, reduced to a percentage of the corresponding mean monthly rainfall, calculated to the nearest whole number, is then plotted against the station on the map for the corresponding month. These values being treated as spot levels, lines called 'isodefs', or lines of equal percentage deficiency from the mean, are then drawn in, in a similar manner to contour lines, isohyets, isobars, and other lines of a similar class."

The author recognizes the need of more and better distribution of data to increase the dependability of the method, but he states that "even under present conditions similar cartographic studies of other severe droughts in this and other recurrent drought areas would afford sufficient fairly reliable data upon which to base schemes of insurance against losses of stock and crops, due to drought, with no greater measure of risk than is now undertaken in fire, mercantile marine, and other insurance schemes."

The problem of the arid subtropics [trans. title], N. D. KOSTETSKIĬ (*Soviet Subtrop. (Soviet Subtrop.)*, No. 1 (1934), pp. 30-44).—Climatological and meteorological data of the southern region of Central Asia in the Union of Soviet Socialist Republics are presented with a discussion of the soils and their adaptability to such specialized crops as ramie, tea, oranges, lemons, olives, guava, apricots, peaches, almonds, peanuts, pecans, and a number of oil-bearing plants.

Monthly Weather Review, [July-August 1934] (*U. S. Mo. Weather Rev.*, 62 (1934), Nos. 7, pp. 221-268, pls. 11, figs. 26; 8, pp. 269-313, pls. 9, figs. 14).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 7.—Radiometeorography as Applied to Unnamed Balloons, by W. H. Wenstrom (pp. 221-226); The Weather of the Great Tillamook, Oreg., Fire of August 1933, by C. I. Dague (pp. 227-231); Long-Period Fluctuations of Some Meteorological Elements in Relation to California Forest-Fire Problems, by L. G. Gray (pp. 231-235); Long-Range Forecasts in Puerto Rico, by C. L. Ray (pp. 235-240); Precipitation Averages for the State of Washington, as Affected by Habitability, by L. C. Fisher (pp. 241-243); Upper-Air Winds over Northern

Alaska during the International Polar Year, August 1932–August 1933, Inclusive, by L. A. Stevens (pp. 244–247); Tables (in Millibars) of the “Pressure of Saturated Aqueous Vapor over Water” at Temperatures from 0° to –50° C., by L. P. Harrison (pp. 247, 248); The Tropical Cyclone of June 16, 1934, in Louisiana, by I. M. Cline (pp. 249, 250); Meteor Trails in Antarctica, by T. C. Poulter (p. 250); Annual Precipitation at Padua, Italy, 1901–33, Inclusive, by W. W. Reed (p. 250); and Tropical Disturbances of July 21–25, 1934, by C. L. Mitchell (p. 251).

No. 8.—A Climatological Review of the Alaska-Yukon Plateau, by R. L. Frost (pp. 269–280); Total Solar Radiation at New Orleans, La., by H. S. Mayerson and H. Laurens (pp. 281–286); The Critical Period of Corn in Northeastern Kansas, by A. D. Robb (pp. 286–289) (see p. 740); Diurnal Variation in the Dew-Point Temperature at Asheville, N. C., by L. T. Pierce (pp. 289–293); Southeasterly Winds of the Southern San Joaquin Valley, Calif., by L. J. Guthrie (pp. 294, 295); Is Low Relative Humidity a Good Indication of Precipitation within the Next 48 Hours? by A. R. Long (p. 295) (abs.); and An Unusual Snowstorm in Southeastern West Virginia, by W. J. Humphreys (p. 295).

Climatological data for the United States by sections, [July–August 1934] (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 21 (1934), Nos. 7, pp. [200], pls. 3, figs. 3; 8, pp. [201], pls. 2, figs. 6).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Meteorological observations, [November–December, 1934], C. I. GUNNESS and A. MADDEN (*Massachusetts Sta. Met. Ser. Buls.* 551–552 (1934), pp. 4 each).—These are the usual summaries of observations at Amherst, Mass., with brief notes on the more significant features of the weather of each month.

The December number contains an annual summary for 1934, which shows that the mean pressure for the year was 30.04 in.; the mean temperature 46.7° F., as compared with the normal of 47.2°, highest 93° June 29, lowest –22° February 9; total precipitation 45.51 in., as compared with the normal of 43.49 in., snowfall 39 in., as compared with the normal of 48.38 in.; mean cloudiness 54.6 percent, bright sunshine 53.7 percent; last frost in spring May 13, first in fall October 2; last snow March 24, first October 13.

Some observations on forty-six years of Ohio weather, C. A. PATTON (*Ohio Sta. Bul.* 544 (1934), pp. 32, figs. 3).—This bulletin supplements one previously noted (*E. S. R.*, 62, p. 610), which ended with 1928, and brings the record for temperature, rainfall, early and late frosts, evaporation, and sunshine up to and including 1933 for the experiment station at Wooster and the district and county experimental farms and, for comparative purposes, gives data for the State at large.

The average annual temperature at Wooster for the 46 years covered by this report was 49.7° F. The highest temperature recorded at the station during that period was 105° August 6, 1918, the lowest –24° January 13, 1912. The average annual temperature for the 3 winter months was 28.6°, for the 3 spring months 48.3°, for the 3 summer months 69.6°, and for the 3 fall months 52.1°. The average annual precipitation for the 46 years was 38.7 in.; the seasonal averages were winter 8.42 in., spring 10.41 in., summer 11.35 in., and autumn 8.52 in. The average date of the last killing frost in the spring was May 10, the first in fall October 7, and the average length of growing season 152 days. The average number of clear days was 138 per year.

SOILS—FERTILIZERS

[**Soil and fertilizer work in Arkansas**] (*Arkansas Sta. Bul. 312 (1934)*, pp. 20, 21, 22–24).—Under the head of availability of rock phosphates, the report notes tests of the effect of fluorine content on availability of rock phosphates and on the growth of plants, both by R. P. Bartholomew; and under the caption Rice Nutrition, tests of nutrient solutions, effect of fertilizer on yield and growth of rice, availability of rice soil elements, nitrogen in submerged soils, effect of heating soil, effect of different treatments on composition of soil solutions, and carbon dioxide effect on soil solutions, all by L. C. Kapp.

[**Soil investigations of the Colorado Station**] (*Colorado Sta. Rpt. 1934*, pp. 9, 27, 28).—The report contains brief notes on the soil plaque method of determining mineral soil deficiency and the *Azotobacter* test for soil fertility.

[**Fertility tests**] (*Georgia Coastal Plain Sta. Bul. 24 (1934)*, p. 108).—Work on the delta soils of the freshwater tide area is noted under the heads of soil management, cover crop trials, and lime requirement studies.

[**Soil investigations of the Iowa Station**] (*Iowa Sta. Rpt. 1934*, pp. 122–138, figs. 2).—Results are briefly noted for work on effects of fertilizers on crops and soil conditions under various rotations in the Wisconsin drift soil area, by P. E. Brown and J. L. Boatman; effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures, by Brown, H. R. Meldrum, A. J. Englehorn, and Boatman; the relative value of red clover, alfalfa, and sweetclover as soil-building crops, by Brown and Boatman; effects of various fertilizing materials on crop growth on (1) the Carrington soils, by Meldrum, Englehorn, and R. E. Bennett, (2) the Grundy soils, by Meldrum and Englehorn, (3) the Clarion loam, by Meldrum and Bennett, (4) the Tama silt loam, by Brown, Meldrum, Englehorn, Bennett, and R. H. Walker, (5) the Muscatine silt loam and (6) the Clinton silt loam, both by Englehorn and Bennett, (7) the Marshall silt loam, by Meldrum, (8) some terrace and bottom-land soils in Iowa, by Meldrum and Englehorn, and (9) the Webster soils, by Meldrum, Englehorn, and Bennett; commercial cultures for the inoculation of legumes and nonlegumes and the fixation of atmospheric nitrogen by nonsymbiotic micro-organisms, both by Walker; occurrence and activities of fungi in Iowa soils, by F. B. Smith; physiological studies on *Rhizobium meliloti* and effects of limestone and legume inoculation on crops and on soil conditions in southern Iowa, both by Walker; the nitrogen and phosphorus contents of Washington County soils, by Brown, Englehorn, and Bennett; base exchange in Iowa soils, by Walker; studies on the available phosphorus in Iowa soils and humus investigations—the formation of humus and the decomposition of organic matter in soils, both by Smith; soil erosion on the Marshall silt loam in Page County, by Brown, J. B. Davidson, H. D. Hughes, and G. B. MacDonald; and character and management of the alkali soils of Iowa, by Brown, Smith, and Boatman.

[**Soil investigations of the Nebraska Station**] (*Nebraska Sta. Rpt. [1933]*, pp. 12, 13).—The station reports investigations of soil friction and soil plasticity and the availability of phosphorus in soils of alkaline reaction as related to the usage of phosphate fertilizer.

[**Soil and fertilizer investigations of the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 308 (1934)*, pp. 11, 12).—Rotation findings concerning phosphates and the Jordan soil fertility plats, both by C. F. Noll and C. J. Irvin, and findings as to the mineral content of four Pennsylvania soils, by C. D. Jeffries, are briefly noted.

[Soil and fertilizer tests in South Carolina] (*South Carolina Sta. Rpt. 1934*, pp. 19-30, 45, 46, 127-132, figs. 2).—The report contains notes on soil acidity and liming and fertilizer recommendations for various crops, by H. P. Cooper and W. R. Paden; and on relation of lime application to availability of potash in soil and on the danger of acid-forming mixed fertilizers, both by Cooper. Other items included are further observations on manganese deficiency in oats at Florence and arsenic solubility in soils, both by W. B. Albert; and a discussion by J. E. Adams of a green manure-fertilizer experiment, green manuring and fertilizer studies in lysimeters, fertilizer ratio experiment with soybeans, and effect of fertilizer on the composition of hay.

[Soil Survey Reports, 1931 Series] (*U. S. Dept. Agr., Bur. Chem and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 5, pp. 35, figs. 2, map 1; 6, pp. 30, figs. 2, map 1*).—The two survey reports here noted were prepared with the cooperation, respectively, of the University of Nebraska State Soil Survey and the Michigan Experiment Station and the Michigan Department of Conservation.

No. 5. *Soil survey of Sherman County, Nebraska*, L. A. Brown et al.—Sherman County, central Nebraska, occupies 366,720 acres and forms part of a great loess-mantled plain which once covered most of eastern and central Nebraska. The Middle Loup River, Oak Creek, and Muddy Creek have carved rather broad valleys into the loose loessial mantle, and these streams provide practically all of the lands of the county with good drainage.

Colby silt loam, covering 39.2 percent of the land area, is the most extensive among 18 types here assigned to 11 series. Hastings silt loam follows with 36.6 percent and Hall silt loam with 11.2 percent.

No. 6. *Soil survey of Bay County, Michigan*, C. H. Wonser et al.—Bay County, at the head of Saginaw Bay, covers an area of 283,520 acres. The surface area is in general undulating, but is almost flat in places. The most extensive of the 34 types which make up the 29 series found is the very fertile Kawkawlin loam, 24.7 percent of the area surveyed.

Soils in relation to fruit growing in New York.—V, *The vineyard soils of the Westfield area, Chautauqua County*, J. OSKAMP (*[New York] Cornell Sta. Bul. 609 (1934), pp. 18, figs. 7*).—In the abstract of this bulletin (E. S. R., 72, p. 15) the quotation should read as follows: "A fairly light-textured soil material varying but slightly in the surface 4 ft., with a bright and uniform shade of brown in the soil and the subsoil, indicating a well-oxidized condition. Such a profile, if it is composed too largely of coarse particles or if there is a very shallow deposit of loam over almost clean sand and gravel, may be lacking in the elements of fertility. Where the profile shows a subsoil heavier than the surface soil, with a clay horizon at a depth of about 2 or 3 ft. and a highly mottled color of the subsoil, indicating a poorly oxidized condition, it is considerably less favorable for grapes. A distinctly unfavorable condition for grapes exists where the profile is marked by a gray or grayish yellow layer close beneath the surface soil, underlaid by a highly mottled subsoil of heavy clay."

Morphology and genesis of the solonetz soils of western North Dakota, C. E. KELLOGG (*Soil Sci.*, 38 (1934), No. 6, pp. 483-501, pl. 1, figs. 5).—The morphology of the solonchak and solonetz of western North Dakota was studied with reference both to the genesis and to the classification of these soils. "It was found that normal soil, solonchak, solonetz, and soloth do not represent exclusive categories, either of morphology or of genesis. Such a soil as the solonchak complex may show some characteristics of both solonetz and soloth, and nearly every solonetz shows some properties of solonchak or soloth." The general cycle of the genesis of these soils from the normal soil and back again to the normal soil, both for the complex types and the flooded types, is shown.

The great importance of the different kinds of vegetation in the evolution of these soils is emphasized. "The differential erosion of the eluviated horizons of such soils gives rise to a pronounced microrelief, greatly lowering the value of the land for either native or cultivated plants."

Bibliography of organic and forest soils, 1926 to 1934 (*U. S. Dept. Agr., Forest Serv., 1934, pp. [2]+33*).—This bibliography, compiled, edited, and mimeographed by the Central States Forest Experiment Station, includes references to organic and forest soils taken from the original articles, abstract journals, and various other sources.

"A departure has been made from the usual type of bibliography in that all titles are in English, and the abstract volume and page are given. It is believed that this procedure will make the bibliography more usable without detracting from its value to those who wish to read foreign articles in the original."

The soil-moisture system, G. B. BODMAN and N. E. EDLEFSEN (*Soil Sci.*, 38 (1934), No. 6, pp. 425-444, figs. 8).—This contribution from the University of California is an analysis of certain fundamental theoretical considerations involved in the study of the behavior of moisture in soils. Factors and concepts included in the discussion are the solid framework, clay and the microstructure, adsorption and escape of water molecules, mechanical forces acting on soil moisture, interrelationships of basic functions, methods of measuring capillary potential function, arbitrary soil-moisture constants, field and laboratory observations on soil-moisture movement, the theory of soil-moisture movement in the liquid phase, and the movement of water in the vapor phase.

Illustrative diagrams and graphs of certain field and laboratory data are used as a basis for parts of the discussion.

The laws of soil colloidal behavior.—XV, The degradation and the regeneration of the soil complex, S. MATTSO and J. B. HESTER (*Soil Sci.*, 39 (1935), No. 1, pp. 75-84).—In the investigation reported upon in this serial contribution (*E. S. R.*, 72, p. 450) from the New Jersey Experiment Stations the amphoteric soil complex which represents partly hydrolyzed salts of polyvalent weak acids and bases was found to be "subject to the following destructive and constructive changes:

"At low and at high pH the basic and the acidic groups, respectively, become ionized and are split off by hydrolytic cleavage and, since the ionized condition represents the most soluble, these groups may be permanently lost by the soil. This process leads to a degradation of the soil. Under other conditions, favorable for the reaction, the degraded complex will unite with acidic or basic groups with which an isoelectric compound may be formed. Conditions permitting this synthetic upbuild will lead to a regeneration of the soil. A study of the aluminated, the silicated, and the phosphated soil colloids shows the conditions and nature of such reactions."

The Cunninghamella plaque method of measuring available phosphorus in soil, A. MEHLICH, E. B. FRED, and E. TRUOG (*Soil Sci.*, 38 (1934), No. 6, pp. 445-461, pl. 1, fig. 1).—In making the tests described in this contribution from the University of Wisconsin, the soil was moistened with a phosphorus-free nutrient solution and made into a plaque in a small Petri dish. One drop of the spore suspension was placed centrally on the surface. After incubation for about 48 hr., a colony, the diameter of which was closely proportional to the concentration of available phosphorus present, was found to develop. A large number of plaque tests were made with about 15 representative molds, including several species of *Cunninghamella*. The influence of reaction, kind of nutrient solution, salt content, and supply of available phosphate were investigated. As a result of these studies, the fungus *Cunninghamella* sp. was chosen because

of its sensitivity to a lack of available phosphate and its marked progressive response to an increasing supply.

"From a number of tests in various soils it was concluded that *C. elegans* and *C. blakeslecana* are best suited for the test, followed by *C. echinulata*, and finally *C. bertholletiae*, which is least suited, since its hyphal growth is less rapid and less dense. In subsequent tests, the minus strains of *C. elegans* and *C. blakeslecana* were used."

The test was compared with two *Aspergillus niger* methods, a chemical method, field tests, and Mitscherlich's method. The results obtained with soils from widely separated areas showed good agreement with field results. The test seemed to work well with the calcareous soils that give great difficulty with some of the other methods.

Effect of the degree of base saturation of a soil on its capacity to fix phosphorus in difficultly available form. A. F. HECK (*Soil Sci.*, 38 (1934), No. 6, pp. 463-470, figs. 5).—The author of this contribution from the Wisconsin Experiment Station reports upon a comparison of Miami silt loam with a Hawaiian laterite (Waipio) soil with reference to the relation between the percentage of saturation with bases and the capacity of the soil to fix phosphates in a difficultly soluble form. The results indicated that "a low degree of base saturation tends to give a soil a greater capacity for fixing phosphorus in difficultly available form than if the soil is more fully saturated with bases. Minimum phosphorus fixation for a soil is attained at from 80 to 90 percent base saturation. For soils having a fair proportion of organic exchange material, this point comes toward the higher value. At the same time, these soils will tend to have a lower pH value at the point of minimum fixation than soils in which the exchange complex is largely inorganic, the breaking point of the former being near 6.3, while for the latter it is from 7.0 to 7.5. The variation in phosphorus fixation that may be brought about by a change in the base saturation of a soil does not usually exceed 20 to 30 percent of the phosphorus applied. There appears to be little difference in this spread for high- or low-fixing soils.

"Increased exchange capacity of a soil tends to decrease phosphorus fixation provided the proper degree of base saturation is maintained. If sufficient base saturation is not maintained, increased exchange capacity tends to increase the capacity of a soil to fix phosphorus in difficultly available form."

The solubility of phosphorus in soils from some Illinois experiment fields. H. J. SNIDER (*Soil Sci.*, 38 (1934), No. 6, pp. 471-476, fig. 1).—A contribution from the Illinois Experiment Station reports a study of the availability of phosphorus on a number of the Illinois soil experiment fields, from which it appeared that the soils studied vary both in solubility of phosphorus and in their power to fix phosphorus, that the solubility and fixation have been influenced by the crop residues-limestone treatment, and that, in general, the soils having the lowest relative solubility and the highest relative fixing power gave the greatest response to rock phosphate as measured by increase in crop yields.

The soils examined fell into three groups, including, respectively, "(1) those fields representing soils containing a sufficient supply of available native phosphorus, so that additional phosphorus applied as a fertilizer is of little value in crop production; (2) those fields representing soils having a low value for soluble phosphorus on the untreated check plats but with the availability of the native phosphates increased by the crop residue-lime treatment, thus rendering added phosphorus in the form of fertilizer of little value; (3) those fields representing soils having low availability of phosphorus on the untreated checks but on which the crop residue-lime treatment did not affect the availability of the native phosphorus sufficiently to offset the value of added phosphorus, thus causing the soils of this group to show significant response to phosphorus treatment."

Relative amounts of calcium carbonate and magnesium carbonate in some Minnesota subsoils, F. J. ALWAY and J. M. ZETTERBERG (*Soil Sci.*, 39 (1935), No. 1, pp. 9-14, fig. 1).—The authors of this contribution from the University of Minnesota report upon the relative contents of calcium carbonate and magnesium carbonate as determined in 25 calcareous subsoils from different parts of Minnesota, most of them from fine-textured soil types developed upon till plains and clayey moraines of the Late Wisconsin drift. The molecular ratio of calcium carbonate to magnesium carbonate ranged from 1.51 to 4.8, with an average of 2.84.

"If it is assumed that all the magnesium carbonate is present in the form of dolomite, the latter constitutes on the average a little more than half of the total carbonates, the minimum found being 32.8 and the maximum 78.6 percent. In the heavy subsoils the supply of magnesium carbonate is very high in comparison with crop needs of available magnesium, varying from 25 to 100 tons per acre-foot."

The factors which influence the use of the conductivity of soil suspensions as a measure of fertility, M. S. DU TOIT and I. S. PEROLD (*Soil Sci.*, 39 (1935), No. 1, pp. 59-74, figs. 3).—The authors of this contribution from the University of Stellenbosch, Union of South Africa, found that "conductivity changes in soil suspensions in the absence of atmospheric CO₂ are caused by (1) micro-organic activity, (2) changes in degree of dispersion of the solid phase, (3) dissociation of electrolytes, resulting from solution of easily soluble salts and from hydrolysis of the colloidal complex. Micro-organic activity in '7 days' increase' is chiefly aerobic and ceases after a few days of incubation. This contribution to conductivity increase is arbitrary and analogous to shaking up a soil with water containing CO₂. It bears no relation to the true micro-organic activity of the soil. During incubation, pH increases as a result of hydrolysis of adsorbed bases and possibly some solution due to the presence of CO₂, with formation of bicarbonates. Cataphoresis and surface adsorption are limiting cases of conduction in electrolytes. The finer soil particles contribute to the conduction of a current, and the degree of dispersion of the soil is therefore an important factor in conductivity determinations. Hydrolyzability of the soil complex is a function of the nature of the complex, the nature and quantity of adsorbed ions, and the pH. In physicochemical comparisons of the colloids in different soil types, equivalent quantities of colloid as regards base-exchange capacity must be used. The amphoteric nature of soil colloids sets a serious limit to the usefulness of such measurements."

The relationships between fertility, 7 days' increase, and hydrolysis are discussed.

Carbon dioxide production by mannite-treated soils as a means of determining crop response to fertilizers, W. B. ANDREWS (*Soil Sci.*, 39 (1935), No. 1, pp. 47-57, figs. 2).—"The production of CO₂ in soils to which mannite has been added under controlled laboratory conditions furnishes a basis for measuring the nitrogen and phosphorus requirements of soils for cotton", according to the author of this communication from the Mississippi Experiment Station, who further believes that "the nitrogen and phosphorus requirements of soils for other crops may be determined by this method as soon as the laboratory data have been properly correlated with sufficient field data."

A method for determining the degree of decomposition that unknown decayed vegetable organic materials have already undergone in nature, G. J. BOUYOUCOS (*Soil Sci.*, 38 (1934), No. 6, pp. 477-482).—The method reported in this contribution from the Michigan Experiment Station consists of heating the materials in a bomb at 310° C. for 24 hr. "The volatilization loss that

takes place at this temperature is divided by the ignition loss of the material, and that gives a certain volatilization index. It is found that the volatilization index of fresh materials is much higher than that of the decayed materials. It is assumed that this difference in the volatilization index represents degree of decomposition of the decayed materials. When the volatilization index of a certain material in both the fresh and the decayed states is known, the degree of decomposition that the decayed material has already undergone can be ascertained.

"By this method it is shown, for instance, that some mucks have already undergone a decomposition of 57 percent from the original state."

The preferential utilization of different forms of inorganic nitrogen in the decomposition of plant materials, E. H. RICHARDS and J. G. SHRIKHANDE (*Soil Sci.*, 39 (1935), No. 1, pp. 1-8).—A contribution from the Rothamsted Experimental Station reports experiments indicating that when straw is placed in contact with both ammoniacal and nitric nitrogen in equal initial concentration under conditions favorable for decomposition the organisms concerned in the earlier stages of break-down show a definite preference for the ammoniacal nitrogen. After 14 days at 35° C. the unassimilated inorganic nitrogen was found to be about equally divided between the ammoniacal and nitrate forms. There was, then, no apparent preference for either form.

"When nitrogen is supplied wholly or partially as nitrate the nitrogen factor, calculated after rotting is complete, is always lower than when ammonia is used. The loss of nitrogen is always greatest when nitrate is present. Sodium nitrate and ammonium nitrate lost 30 and 15 percent more nitrogen, respectively, than ammonium carbonate in equal original concentration. As a result of this loss of, presumably, elementary nitrogen from nitrate, the relative assimilation of ammonia may be greater than the figures indicate, since the drop in nitrate includes both the nitrogen lost as well as that assimilated."

Mineral constituents in relation to chlorosis of orange leaves, N. H. PARBERY (*Soil Sci.*, 39 (1935), No. 1, pp. 35-45).—Chlorosis of orange trees is reported as an increasingly serious disease at Gosford, New South Wales. The symptoms of the disease are described; and analyses of normal leaves from healthy or very slightly affected trees and of chlorotic leaves are given.

"The salient feature in comparing the mineral composition of healthy and diseased leaves is the deficiency of magnesium in the latter. The normal leaves have a significantly greater content of magnesium and nitrogen. The content of potassium, sodium, silica, and chlorine is higher in the chlorotic leaves. Ash, calcium, manganese, iron, sulfate, and phosphate contents are not significantly different. The composition of normal orange leaves grown under vastly different soil and climatic conditions differs little from normal leaves grown at Gosford."

"There is no significant degree of correlation between replaceable bases in these [Gosford] soils and the uptake of the corresponding bases."

Soil conditions at Gosford are briefly discussed, and the major replaceable base constituents of a number of soils are given.

Toxicity of manganese to Turkish tobacco in acid Kentucky soils, C. E. BORTNER (*Soil Sci.*, 39 (1935), No. 1, pp. 15-33, pls. 5).—A toxicity due to excessive manganese and similar to that earlier demonstrated at the Connecticut [New Haven] Experiment Station (E. S. R., 62, p. 620) showed itself in certain of the acid Kentucky soils and also appeared in solution cultures containing 15 p. p. m. or more of added manganese. Adequate phosphate treatment or liming lessened or eliminated the injury. It appeared that an excess of soluble manganese is probably a factor in the unfavorable effects on crop growth of the acid condition of many soils in Kentucky.

AGRICULTURAL BOTANY

The structure of protoplasm, W. SEIFRIZ (*Bot. Rev.*, 1 (1935), No. 1, pp. 18-36).—This is a condensed discussion of the more recent pertinent contributions to our knowledge of the subject. There is also a bibliography.

On growth protoplasmic streaming and vegetative fusions in *Humaria leucoloma* [trans. title], A. JAHN (*Ztschr. Bot.*, 27 (1934), No. 4, pp. 193-250, figs. 10).—Continual mass streaming of the exceedingly fluid, homogeneous cytoplasm through the hyphae was observed, resembling that reported in 1866 for a number of fungi by [M.] Woronin. It reached a speed of 15 mm per minute. The streaming took place through wide perforations in the septa but did not carry nuclei nor vacuoles along with it. Hyphal elongation reached 52 μ per minute. Streaming took place from regions of high turgor pressure to regions of lower pressure, and generally toward the hyphal tips. The direction could be reversed by local application of osmotically active materials and by increased transpiration. Changes in direction were also brought about by hyphal fusion.

The structure of the walls of the higher plants, D. B. ANDERSON (*Bot. Rev.*, 1 (1935), No. 2, pp. 52-76, pl. 1, figs. 5).—Recent literature is reviewed and discussed. Although many problems of cell wall structure are still unsettled, the author believes that from the facts accumulated thus far the following generalizations may safely be made: "The cell wall is a laminated structure composed of many lamellae that differ in chemical and physical properties. The skeletal framework of the walls of the higher plants is composed of cellulose. Cellulose is composed of long parallel chains of glucose residues. These are definitely oriented in the wall, but the exact method of their orientation is a matter of dispute. The cellulose framework of the wall is permeated with noncellulose materials of amorphous character. It is possible that the plant cell wall may possess some of the characteristics usually attributed to living material during certain phases of its growth."

A bibliography is given.

The cytology of hemp [trans. title], G. B. MEDVEDEVA (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.)*, 6 (1934), No. 1, pp. 34-54, figs. 31; *Ger. abs.*, pp. 52, 53).—Irregular reduction division found in the microsporogenesis of Italian hemp (*Cannabis sativa*) is described, and the possible causes are discussed.

Abnormalities in development of pollen in various kinds of hemp and in grafts of hemp [trans. title], L. P. BRESLAVETS (*Trudy Inst. Nov. Lub. Syr. (Lenin Acad. Agr. Sci. U. S. S. R., Trans. New Bast-Fibers Res. Inst.)*, 6 (1934), No. 1, pp. 55-67, figs. 8).—This contribution represents a part of the studies on fiber plants being conducted at Moskva (Moscow).

Relation of carotinoid pigments to sexual reproduction in plants, A. E. MURNEEK (*Science*, 79 (1934), No. 2058, p. 528).—The results of a large number of determinations showed that in the leaves of both short- and long-day groups of *Cosmos*, *Salvia*, and *Soja* approximately the same concentration of chlorophyll was present, but plants that had changed from vegetative development to the reproductive state had an increased carotin and xanthophyll content. Moreover, the concentration of the two carotinoids seemed to reach a maximum at the time of flowering and then to decrease.

On the hormonal nature of the inhibiting effect of the leaves in *Bryophyllum crenatum* [trans. title], A. UHROVÁ (*Planta, Arch. Wiss. Bot.*, 22 (1934), No. 3, pp. 411-427, figs. 6).—Substances held to be identical with the growth hormone (auxin), and not of specific nature, are produced in the leaves and petioles of this plant. These inhibit the growth of the axillary buds and can be taken up in agar.

Investigations on the determination of cell sap concentration in the cambial zone where growth in thickness is excentric [trans. title], P. JACARD and A. FREY-WYSSLING (*Jahrb. Wiss. Bot.*, 79 (1934), No. 5, pp. 655-680, figs. 9).—A copper-constantan thermocouple, inserted into a hypodermic needle tip mounted in a glass tube, was used as a probe to determine thermoelectrically the freezing-point depression of samples of different plant tissues preliminary to using the technic for the determination of differences in osmotic coefficients in the cambial zone of woody plants. The results of the initial tests are given, and the sources of error to be guarded against in the use of the method are discussed.

Relation of light, potassium, and calcium deficiencies to photosynthesis, protein synthesis, and translocation, R. P. HIBBARD and B. H. GRIGSBY (*Michigan Sta. Tech. Bul.* 141 (1934), pp. 39, figs. 4).—The results are reported of experiments conducted over a period of years at the station in which, through the use of water cultures, a study of the relation of potassium and calcium and light to photosynthesis, protein synthesis, and translocation in the pea plant has been attempted.

The plants used were seedlings of the Alaska variety of garden pea (*Pisum sativum*). They were grown in 12-l glazed stoneware jars, 40 or 50 in each, and so supported that all roots were kept immersed. For a week or two after germination the plants were grown in a "complete solution" suitable for good pea growth. The cotyledons were then removed and the plants continued in the same solution for at least another week. The solutions were then changed and were renewed about twice weekly, as well as aerated for 0.5 hr. daily. The plants were grown under three different light exposures. The tests usually ran 2 weeks. Controls were carried under similar conditions in complete solutions. Observations, measurements, and chemical analyses were made on all plants.

The bulletin should be consulted for methods of analysis, for the composition of the different solutions used, and for the detailed results.

Photosynthesis, translocation, and protein synthesis were operative in plants growing in all solutions deficient in potassium or calcium. This was indicated by an increased weight in dry matter of the plant at the end of the 2-week period. The rate of increase was below that of the check plants. The plants in the deficient solutions also produced simple sugars, sucrose, total sugars, starch, hemicellulose, total nonsugars, and proteins, but in less quantity than was produced by those plants growing in complete solutions.

This is not believed to be due to a lack of either potassium or calcium, but because these deficiencies disturbed and retarded the protoplasmic mechanism which, in turn, disturbed and retarded functions. A certain physiological tone or well-being is essential in regular protoplasmic activity. Light, quality, and period of illumination had a greater effect on the type and quantity of growth than did the differential salt solutions. No evidence was found that increases in potassium or calcium were paralleled by nitrogen and protein increases. Potassium and calcium absorption were found to be more rapid in the light. A precipitate of dicalcium and tricalcium phosphate increased on the roots of plants as the calcium was increased in the solutions. Light intensity was also a factor in the amount of precipitate formed.

Total ash in plants was the highest in those growing in minus Ca solution. The percentage of calcium on the dry weight basis in plants growing in solutions lacking potassium was higher than in checks or in minus Ca solutions. The percentage of potassium in plants growing in solutions lacking calcium was higher than in the complete or minus K solutions.

Certain color changes in old and young leaves, certain injuries to tendrils, leaves, and stems, and certain growth modifications resulting from calcium and potassium deficiencies were noted.

Winter transpiration of woody plants in relation to their geographic distribution [trans. title], A. V. RĬAZANTSEV (A. W. RIASANZEV) (*Izv. Biol. Nauch. Issledov. Inst. Permsk. Gosud. Univ. (Bul. Inst. Rech. Biol. Univ. Perm)*, 9 (1934), No. 1-3, pp. 71-86; *Ger. abs.*, pp. 85, 86).—First-year twigs of similar length and weight were taken from 53 species of woody plants, including apple, cherry, raspberry, rose, currants, and many forest trees and shrubs growing in the botanical garden at Perm, U. S. S. R., were set up under similar conditions, and after a period were weighed to determine the comparative speed of water loss under winter conditions. Those species which extend far to the north were characterized by slow water loss, and those occurring in the south by intensive water loss. In the individual genera among the conifers, the northern representatives, in general, transpired less than those occurring in regions farther south. It is felt that these differences are important in determining distribution, since those transpiring least suffer least, in general, from winter injury.

Methods for controlling the environment of greenhouse plants, P. W. WILSON and C. E. GEORGI (*Bot. Gaz.*, 94 (1932), No. 2, pp. 346-363, figs. 3).—In this contribution from the Wisconsin Experiment Station, methods are described for the partial regulation of the gas, temperature, humidity, and light environment of greenhouse plants for experimental purposes.

GENETICS

On chromosome structure under infrared rays [trans. title], K. HRUBÝ (*Planta, Arch. Wiss. Bot.*, 22 (1934), No. 5, pp. 685-691, figs. 8).—The technic for infrared photography of the chromosomes is described. The results led the author to believe that the chromosomes possess a firm surrounding membrane. That this does not mean the absence of chromomeres is said to be evident from the clearness with which they appear in some of his photographs.

Genetic studies with a heterothallic ascomycete (*Bombardia lunata* n. sp.) [trans. title], H. ZICKLER (*Planta, Arch. Wiss. Bot.*, 22 (1934), No. 5, pp. 573-613, figs. 12).—A series of mutants were found and described. Crossing experiments showed that the genes for the different mutations segregated out in the ascus. Functional spermatia were present and were used in the hybridizing work.

Self-fertility and self-sterility in Beta [trans. title], G. SUNDELIN (*Sveriges Utsädesför. Tidskr.*, 44 (1934), Nos. 5, pp. 329-352, fig. 1; 6, pp. 363-385, fig. 1; *Eng. abs.*, p. 383).—Investigations on self-fertility and self-sterility in beets (*E. S. R.*, 55, p. 737) during the period 1919-30, largely with sugar beets and forage beets, are reviewed, with a list of 54 references to pertinent work of others.

The pollen from a beet seed field was shown to be carried a considerable distance by the wind. Seed setting by isolation and selfing in paper bags varied from year to year, the annual variation being attributed mainly to the temperature and moisture content of the air within the bags. High temperature and low humidity generally gave bad results. Experiments wherein bagging conditions were varied in different ways demonstrated that bagging in itself depresses seed setting, and that generally the isolated flowers received enough pollen on their stigmas. Seed production in bags was much less with selfing than when the isolated flowers received unrelated pollen, indicating that self-sterility is the main cause for very low seed setting by selfing in bags.

Where selfing in several families was continued for a number of generations, the average self-fertility showed marked increase by continued selfing, explained as due to automatic selection of inherently self-fertile families, whereas the genetically self-sterile families sooner or later fail to produce any seed. In families inbred for several generations the general fertility showed a decrease as compared to the population, which was interpreted as a decrease of vitality due to inbreeding. Several of the most self-fertile families were shown to be highly autogamous when allowed to bloom surrounded by unrelated plants.

Inheritance in *Nicotiana*.—I, **Study of the glaucous and the yellow characters in *N. tabacum* L.**, J. A. B. NOLLA (*Jour. Agr. Univ. Puerto Rico*, 18 (1934), No. 4, pp. 443-462, pl. 1).—The inheritance of a yellow (*y*) plant color in tobacco apparently distinct from similar deficiencies reported earlier and of glaucous (*Ceniza* (*Ce*)) was studied first at the Puerto Rico Insular Experiment Station and continued at the Cornell and Wisconsin Universities. Normal green was dominant to these characters, being differentiated by a single factor pair (*Yy*) from yellow and by two pairs (*Ce₁ce₁ Ce₂ce₂*) from glaucous. Factors for glaucous and for yellow were inherited independently of each other.

The inheritance of nicotine content in *Nicotiana tabacum* [trans. title], J. HACKBARTH and R. V. SENGBUSCH (*Züchter*, 7 (1935), No. 1, pp. 1-5).—Nicotine-free strains of *N. tabacum* were isolated from different kinds of tobacco. The freedom from nicotine in these strains was recessive to the normal nicotine content of tobacco and depended upon the effect of a single recessive factor. This factor was the same in both of two Müncheberg nicotine-free strains, crosses between them giving nicotine-free plants in both cases.

On the artificially induced mutations and polyploid plants of rice occurring in subsequent generations, K. ICHIJIMA (*Imp. Acad. [Japan] Proc.*, 10 (1934), No. 6, pp. 388-391, figs. 10).—Mutations induced in rice by treatment with X-rays, ultraviolet rays, and variations in temperature, and appearing in the *F*₁ generation and noted as recessive, included dwarfs, miniatures, various spike, leaf, and awn characters, and also sterility and early maturity, covering practically all types reported by others as occurring spontaneously. Several mutations and also heteroploid and polyploid plants were found in the *F*₂ or *F*₃.

Genetics of *Zea mays*, W. H. EYSTER (In *Bibliographia Genetica*. 's Gravenhage (*The Hague*): Martinus Nijhoff, 1934, vol. 11, pp. 187-392, figs. 91).—This comprehensive review of genetic investigations with corn treats in order of the origin and genetic relationships of corn; its biology; culture and experimental technic; the inheritance of characters of the root, stem, leaf, chloroplastids and their pigments, plant colors, the tassel and the male gametophyte, the pistillate inflorescence and the ear, sterility, sex, pericarp, endosperm, and embryo; genes and their interactions in corn; linkage; and chromosomes. An alphabetical list of genes in corn already identified, linkage maps, a bibliography embracing 536 titles, and an index are also included.

Investigation of seed setting, morphology, and fertility in *Aegilops-Secale* hybrids [trans. title], E. OEHLER (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 67 (1934), No. 2, pp. 317-341, figs. 12).—Eighteen species of *Aegilops* were crossed with different kinds of rye (*S. cereale*). The average seed setting varied among the *Aegilops* species, this variation seeming to be due primarily to differences in the periods of blooming in the parent species. Seed setting for the entire group of hybrids averaged 8.03 percent. *Aegilops* was dominant in a number of important characters and several characters were intermediate, whereas *Secale* was dominant only in pubescence of the stem below the spike. All *F*₁ hybrids were pollen sterile. Backcrosses with *Aegilops*,

Secale, and wheat failed to produce seed, and plants growing in the open seldom developed seed. While *Aegilops-Secale* hybrids are not completely sterile, they are only slightly fertile.

The cytology of a backcross population derived from (*Allium cepa* × *fistulosum*) × *fistulosum*, S. L. EMSWELLER and H. A. JONES (*Amer. Nat.*, 68 (1934), No. 718, pp. 467, 468).—Whereas in *A. fistulosum* (leek) the chiasmata of each bivalent at IM were almost entirely localized at the constriction region and in *A. cepa* (onion) they were arranged at random, the hybrids between the two species exhibited a random arrangement. In 17 backcrosses the chiasmata were localized in 10 cases and randomized in 7.

Cell size in relation to chromosome lengths in garden peas, H. A. BRUCE (*Penn. Acad. Sci. Proc.*, 6 (1932), pp. 89–91, fig. 1).—Using five varieties of garden peas, namely, Improved Telephone, Alderman, Nott Excelsior, Little Marvel, and Prince Edward, the author observed a tendency for cell size to increase gradually with chromosomal length.

Chromosomal lengths in five varieties of the garden pea (*Pisum sativum*), H. A. BRUCE (*Penn. Acad. Sci. Proc.*, 6 (1932), pp. 87–89, fig. 1).—Studies of the root tip cells of Little Marvel, Nott Excelsior, Improved Telephone, Alderman, and Prince Edward pea plants failed to show any definite association between chromosomal length and plant height. Improved Telephone had the longest chromosomes and Alderman the shortest, with the other three varieties ranged between.

Tomato races with long and short A chromosomes, M. and J. W. LESLEY (*Amer. Nat.*, 68 (1934), No. 718, pp. 463, 464).—Among the progeny of triploid tomatoes there were found at the Citrus Experiment Station, Riverside, Calif., certain races with long and others with short chromosomes associated with the nucleolus at diakinesis in the pollen mother cells. One race with long A chromosomes was outstandingly vegetative until late in the season, and one plant of this race was partially male sterile, but two others with long chromosomes were reasonably fertile. The nucleolar chromosomes of the short type are frequently about half as large as the long chromosomes.

Cytological conditioned gamete and zygote sterility in triploid apples [trans. title], P. STEINEGGER (*Gartenbauwissenschaft*, 8 (1934), No. 3, p. 55).—Tracing the corresponding ovule and seed development stages in the diploid variety Berner Rosenapfel and in the triploids Boskoop and Gravenstein, the author found that reduction divisions of the mother cells proceed normally in the diploids. Occasional deviations from normal observed in the formation of embryo sacs were ascribed by the author to nutritional disturbances. On the other hand in the triploids there were noted strong disturbances in the reduction divisions which were followed by an unequal division of the chromosomes. There were observed pollen mother cells with more than the usual four tetrads. The embryos and the endosperms were often abnormal and observed to degenerate at various stages.

Chromosome number and pollen germination in pears, A. A. MOFFETT (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 4, pp. 321–326).—Cytological examination at the John Innes Horticultural Institution of the pollen mother cells of 34 varieties of pears showed 27 to be diploid and 7 triploid. The triploid varieties were Beurre d'Amanlis, Catillac, Beurre Diel, Conseiller de la Cour, Doyenne Bussoch, Pitmaston, and Uvedale St. Germain. Among the diploids were Beurre Bosc and William Bon Chretien (Bartlett). In pollen germination tests the diploids as a whole, with one notable exception, Marguerite Marillat, exhibited considerably higher viability than did the triploids. Considerable variation was found in different examinations of the same variety of pollen.

Cytological studies in cultivated pears, A. A. MOFFETT (*Genetica [s Gra-venhage]*, 15 (1934), No. 5-6, pp. 511-518, pl. 1, figs. 6).—Presenting much of the data covered in the above paper, the author discusses in greater detail the behavior of the diploid and triploid pear chromosomes during meiosis. Secondary pairing was observed at the metaphase of meiosis in the diploids, but no multivalents were noted. In the triploids no associations higher than trivalents were observed. The author believes that the primary basic chromosome number in the Pomoideae is 7.

Parthenocarp and apomixis in the grape [trans. title], A. M. NEGRUȚ (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, 8. ser., No. 2 (1934), pp. 229-268, figs. 2; *Eng. abs.*, pp. 267, 268).—Castration and self-pollination experiments with a large number of varieties of vinifera grapes of different flower types revealed varieties that would not even produce parthenocarpic berries. Others produced seedless berries, berries with sterile seeds, with endosperm, and still others with undeveloped and developed embryos. Varieties were discovered capable of spontaneous apomixis and others of induced apomixis. Seeds of the variety Nimrang when germinated in an incubator produced two seedlings each. The author suggests that in view of the great variability observed it is inadvisable to draw generalizations from limited material.

The embryological prerequisites of the shedding of flowers in the grape Chasselas Gros Coulard [trans. title], M. LAZAREVSKIȚ (LAZAREVSKY) (LAVREVSKY) (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, 8. ser., No. 2 (1934), pp. 213-228, figs. 12; *Eng. abs.*, pp. 227, 228).—Cytological studies of the flower buds of the Chasselas Gros Coulard, a variety distinguished by profuse shedding of the flowers, indicated that normally developed embryo sacs are rare in this grape. Sometimes not a single ovule in the ovary developed an embryo sac, and frequently at the time of shedding of the calyptra the egg cell and synergid degenerated. Degeneration of the embryo sac led to the formation of a large number of sterile flowers incapable of being fertilized by any kind of pollen.

Karyologic and genetic studies with *Fragaria*.—I, **A fertile tetraploid hybrid between *F. nipponica* ($n=7$) and *F. elatior* ($n=21$)** [trans. title], F. A. LILLENFELD (*Japan. Jour. Bot.*, 6 (1933), No. 3, pp. 425-458, figs. 37; *abs. in Gartenbauwissenschaft*, 8 (1934), No. 3, p. 59).—In the first filial generation of a cross between *F. elatior* ♀ with 21 basic chromosomes and *F. nipponica* ♂ with 7 chromosomes there were obtained fertile hybrids with 28 somatic chromosomes. As to sex, there were about 50 percent males and 50 percent females. The reciprocal cross was generally difficult and yielded only a few male hybrids with 35 somatic chromosomes. These pentaploids are supposedly due to a doubling of an *F. nipponica* genom. The F_2 obtained from the F_1 tetraploids showed marked segregation of the parental characters, particularly leaf form and vigor. Besides very vigorous seedlings there occurred dwarfs. Of 11 plants studied, 10 had 28 and 1 had 42 somatic chromosomes. Back-crossing of the tetraploid F_1 hybrids to their higher chromosome parent was easily accomplished in either direction. Of 5 seedlings examined 4 had 35 and 1 had 36 or 37 somatic chromosomes. Numerous selfings of *F. nipponica* resulted in only three dwarfs. It is believed that the *F. nipponica* genom is homologous to one of the three *F. elatior* genoms, and that the two remaining *F. elatior* genoms are homologous with one another.

Hybrids between *Fragaria vesca* and *F. elatior* [trans. title], N. I. A. FEDOROVA (*Trudy Lab. Genet. [Akad. Nauk S. S. S. R.] (Bul. Lab. Genet.)*, No. 9 (1932), pp. 109-114, fig. 1, *Eng. abs.*, p. 114; *abs. in Gartenbauwissen-*

schaft, 8 (1934), No. 3, p. 72).—Crosses between *F. vesca* with 7 haploid and *F. elatior* with 21 haploid chromosomes yielded 5,430 seeds, almost all with *F. vesca* as the ovule parent. In fact the reciprocal cross proved almost completely sterile. A total of 15 plants was obtained of which 12 were exactly like the mother, 2 were tetraploid ($n=14$) and 1 pentaploid ($n=17$). The 12 matroclinous seedlings are believed the result of apogamy or of accidental self-pollination. Success obtained in securing hybrids between *F. vesca* and *F. elatior* is attributed to the large number of seeds involved.

Genetical and cytological studies of Musa.—III, Chromosome numbers in the Musaceae, E. E. CHEESMAN and L. N. H. LARTER (*Jour. Genet.*, 30 (1935), No. 1, pp. 31–52, figs. 28).—Of 29 fertile *Musa* varieties examined at the Imperial College of Tropical Agriculture, Trinidad, 27 were found to possess 22 diploid chromosomes. The two exceptions (with 20 diploid chromosomes) were clons of *M. textilis*. The authors conclude that the basic number in *Eumusa* is 11. In a total of 92 determinations made on seedless, edible banana varieties 81 had 33, 9 had 22, 1 had 32, and 1 had 34 diploid chromosomes. *M. ensete* of the subgenus *Physocaulis* had 18 diploid chromosomes. These data and also records on related genera suggest considerable heterogeneity, not only in the family Musaceae but within the genus *Musa* proper.

The chromosomes of the banana [trans. title], E. A. GRANER (*Rev. Agr. [Brazil]*, 9 (1934), No. 7–8, pp. 333–340, pls. 2, figs. 5; *Eng. abs.*, p. 338).—Studies with *Musa cavendishi* (seedless) and *M. textilis* (seed bearing) growing in the Rio de Janeiro Botanical Garden revealed 33 and 22 somatic chromosomes in the two forms of banana, respectively.

Meiosis in Digitalis ferruginea with special reference to the anachromatic and catachromatic processes, S. F. WENTZEL (*Amer. Jour. Bot.*, 20 (1933), No. 7, pp. 493–501, figs. 8; *abs. in Pennsylvania Sta. Bul.* 308 (1934), p. 30).—"The genus of the foxgloves (*Digitalis*) is characterized cytologically by having extremely small chromosomes. *D. ferruginea* was studied cytologically in order to determine the behavior of the chromosomes of these plants during the reduction divisions. The chromosomes maintain their identity throughout the two divisions of the maturation processes. During the resting stage the individual chromosomes may be seen clearly."

The "eye" of the phlox, J. P. KELLY (*Jour. Heredity*, 25 (1934), No. 5, pp. 182–186, figs. 3; *abs. in Pennsylvania Sta. Bul.* 308 (1934), p. 30).—"The solid, star-shaped, colored center in the common annual phlox is separable into two units, ring of color next to the throat and a set of five flashes adjoining the throat ring. The colored flowers with halo eyes (a narrow colored throat ring, followed outwardly by a white circle) proved to be dependent on another hereditary unit. The presence of halo-eye with star-eye breaks the star into an inner throat ring separated from its outer points by a white or whitish area."

[Breeding investigations with livestock at the Iowa Station] (*Iowa Sta Rpt.* 1934, pp. 44–47, 59, 60, fig. 1).—Brief reports are given on inbreeding Poland China hogs, by J. L. Lush and C. C. Culbertson; amount and kind of inbreeding and other breeding practices employed in the development of the pure breeds of livestock, by Lush; the mating of a Yorkshire boar to a Duroc-Poland sow and a Poland sow, and the mating of a Poland boar to a Duroc-Poland crossbred sow, by P. S. Shearer and Culbertson; persistency and inheritance of milk and fat production among cows in Iowa Cow Testing Association herds, by Lush and G. G. Gibson; inbreeding, linebreeding, outbreeding, and crossbreeding with Single Comb White Leghorns, by N. F. Waters and W. V. Lambert; and the influence of incubation temperature on avian embryonic growth rates, by E. W. Henderson.

Mammary development and function, S. A. ASDELL, H. J. BROOKS, and H. R. SEIDENSTEIN ([*New York*] *Cornell Sta. Rpt.* 1934, p. 72).—The effects of injections of theelin and progesterin on mammary development in ovariectomized and hypophysectomized rabbits and of injections of an anterior hypophysis extract into poor-yielding milk goats are briefly noted.

The effect of alkali on the testicular hormone, T. F. GALLAGHER and F. C. KOCH (*Jour. Biol. Chem.*, 104 (1934), No. 3, pp. 611-617).—The results of experiments on the treatment of the testicular hormone extracts with alkali showed that a treatment for 3 hr. destroyed the active principle in bull testis extract, but did not destroy the hormone in human male urine. These results indicate that the active principles from the two sources differ chemically but produce similar biological action.

On the physiology of cold blackening in Russian rabbits [trans. title], R. DANNEEL (*Biol. Zentbl.*, 54 (1934), No. 5-6, pp. 287-291, fig. 1).—Studies of the pigmentation of isolated pieces of skin from Himalayan rabbits showed that pigment production is brought about by two conditions—first, a low temperature phase independent of acidity and not hindered by hydrocyanic acid, and second, a warm phase dependent upon acidity and in which pigment formation is stopped by hydrocyanic acid.

FIELD CROPS

A very rapid and easy method of testing the reliability of an average and a discussion of the normal and binomial methods, S. R. MILES (*Jour. Amer. Soc. Agron.*, 27 (1935), No. 1, pp. 21-31, figs. 3).—This is a contribution from the Indiana Experiment Station.

Final report of the plant improvement project conducted by the University of Nanking, Cornell University, and the International Education Board, C. H. MYERS (*Univ. Nanking, Col. Agr. and Forestry Spec. Rpt.* 1 (1934), pp. IV+56, pls. 4, fig. 1).—This final report of the 5-yr. cooperative project designed to organize and conduct a comprehensive crop improvement program, involving the principal food crops of famine areas of central and northern China, and to train workers in the principles, methods, application, and organization of plant improvement, records special activities for 1931 and gives a summarized statement of the project's development during the period 1925-31, evaluates its accomplishments and contributions, and makes certain recommendations for the future. The plant breeding work reviewed dealt with wheat, barley, soybeans, rice, kaoliang, millet, corn, and cotton.

[Agronomic research in Arkansas], M. NELSON, C. K. MCCLELLAND, C. R. ADAIR, J. W. JONES, J. O. WARE, O. A. POPE, J. R. COOPER, and V. M. WATTS (*Arkansas Sta. Bul.* 312 (1934), pp. 10-20, 21, 22, 24-27, 44, 45).—Progress results are reported from experiments with field crops (E. S. R., 71, p. 460) at the station and substations including variety trials with cotton, corn, wheat, winter and spring oats, rye, barley, rice, grain sorghum, sorgo for sirup, soybeans and cowpeas for seed and hay, and peanuts; breeding work with cotton, corn, wheat, and rice; genetic studies with cotton; classification of sorgo strains; fertilizer trials with cotton, rice, potatoes, and sweetpotatoes; study of the fertilizing effects of legumes on corn, cotton, rice, and oats; crop rotations variously fertilized; cultural (including planting) tests with cotton, corn, rice, and soybeans; effects of cutting and fertilizer treatments on duration of alfalfa stands; study of tillering in corn varieties; trials of mung beans for hay and seed; interplanting of legumes in corn and effects on yield of the succeeding crop of cotton; control of rice weeds; irrigation of corn, cotton, and soybeans

and yields of rice following these crops; cotton fiber investigations concerned with the effects of soil type and season on length and strength of fiber, and the merits of a photo-electric method developed for determining fiber-length distribution in cotton; and pasture studies. The cotton fertilizer studies dealt with formulas for different sections, rates of application, placement, home v. factory mixed, and nitrogen carriers.

[**Field crops work in Colorado**] (*Colorado Sta. Rpt. 1934, pp. 9, 10, 12, 13, 20, 22, 23*).—Brief reports of progress (E. S. R., 70, p. 609) are given from linkage studies with barley; planting tests with corn and wheat; range improvement experiments; studies of alfalfa seed quality, sorghum-Sudan grass hybrids, and millet seed; influence of variety and curing methods on the vitamin A, B, and G contents of alfalfa hay; and a study of the effects of starch and mineral content on quality, strain and variety tests, improvement by selection, and seed certification, all with potatoes.

[**Field crops research at the Georgia Coastal Plain Station, 1933**] (*Georgia Coastal Plain Sta. Bul. 24 (1934), pp. 12-48, 64-66, 97, 98, figs. 3*).—Field crops experiments (E. S. R., 70, p. 762) reviewed for 1933 and for various periods of years comprised variety tests with cotton, corn, oats, wheat, rye, barley, peanuts, lespedeza, soybeans, cowpeas, winter peas, vetch, crotalaria, pasture grasses, sweetpotatoes, and miscellaneous summer forage crops; breeding work with corn, oats, and peanuts; fertilizer experiments with cotton, corn, oats, peanuts, velvetbeans, winter peas, vetch, sweetpotatoes, and tobacco; winter cover crops for cotton and corn; cultural (including planting) experiments with oats, wheat, cotton, peanuts, lespedeza, soybeans, winter peas, vetch, and sweetpotatoes; and pasture studies. Certain lines of research were in cooperation with the Georgia College of Agriculture, the Georgia Experiment Station, and the U. S. Department of Agriculture.

[**Farm crops experiments in Iowa**], C. M. KING, J. M. AIKMAN, F. G. BELL, A. L. BAKKE, J. N. MARTIN, F. S. WILKINS, H. D. HUGHES, P. E. BROWN, F. B. SMITH, L. C. BURNETT, J. B. WENTZ, C. Y. CANNON, M. T. JENKINS, A. A. BRYAN, J. L. ROBINSON, E. R. HENSON, W. G. GAESSLER, R. W. JUGENHEIMER, E. V. COLLINS, C. S. REDDY, H. GIESE, S. M. DIETZ, H. C. MURPHY, C. C. CULBERTSON, J. C. ELDREDGE, E. W. LINDSTROM, and A. T. ERWIN (*Iowa Sta. Rpt. 1934, pp. 72, 73, 74, 76-78, 104-122, 140, 141, 162, 163, 164, figs. 3*).—Progress (E. S. R., 71, p. 460) is reviewed briefly for breeding work with oats, barley, wheat, popcorn, soybeans, and potatoes; variety tests with oats, wheat, barley, popcorn, alfalfa, red clover (strains), sweetclover, soybeans, potatoes, and sorgo; tests of sweetpotato seedlings produced through the sexual or seed-ball method of propagation; trials of legumes and grasses for hay and pasture; variety-cultural experiments with oats, wheat, and barley; cultural studies with reed canary grass, sugar beets, and with alfalfa on bacterial wilt-infected soil; the effects of artificial injury (simulating hail injury) on the development of corn, oats, and barley; the effect on alfalfa of spring-burning natural mulch material; cytology and physiology of winter hardiness in biennial white sweetclover; effect of cutting red and alsike clovers at different times; effect of Sudan grass in rotation on corn yields; trials of nurse crops for small-seeded legumes; trials of legumes for green manure; effect of fertilizers on storage quality of sweetpotatoes; permanent pasture improvement; the relation of moisture to respiration in stored grain; studies of the annual spread of and control methods for creeping Jennie and leafy spurge; study of seed coat structure and environmental factors affecting germination of weed seeds; testing Kentucky bluegrass seed for purity; and eradication of biennial sweetclover by cultivation.

Corn investigations dealt with genetic interrelations and prepotencies of inbred lines; genetic studies; the relation of time of planting to yield and quality of produce among crosses between inbred lines; comparison of inbred lines obtained from open-pollinated varieties and from crosses between inbred lines; improvement through the use of inbred lines; the relation between the development and seed value of the corn kernel; ear and kernel characteristics of seed corn in relation to yield; growth response of corn hybrids and varieties on soils of different levels of fertility and on various soil types; the measurement of limiting environmental factors in the growth of the plant at different rates and spacings; correlation between composition and stiffness of stalk; rate, date, and method of planting varieties differing in maturity; trials of planting methods; an adaptation study of varieties, strains, and hybrid combinations in different parts of Iowa; storage studies; maintenance of pure seed sources of improved crop varieties through field inspection and certification; and the production and distribution of seed of corn hybrids and of the parents from which they are derived.

A number of the projects were in cooperation with the U. S. Department of Agriculture.

[**Field crops investigations in Nebraska**] (*Nebraska Sta. Rpt.* [1933], pp. 8-12, 15-17, 31, 32, 34, 35, 36, 37).—Continued agronomic research (E. S. R., 69, p. 512) reported on from the station and substations included variety tests with oats, barley, spring and winter wheat, corn, grain sorghum, sorgo, potatoes, alfalfa, soybeans and annual forage crops; breeding work with corn, wheat, oats, and alfalfa; studies of storage of seed, of nutritional conditions underlying the development of stolons and tubers, and strain tests, all with potatoes; cultivation (including planting) experiments with corn, wheat, and potatoes; comparison of sorghums and corn for grain, fodder, and silage; the draft of alfalfa and other legumes on soil moisture (E. S. R., 71, p. 765); fertilizer tests with sugar beets; efforts to improve permanent pastures and meadows by fertilizers, cultural practices, reseeding, and weed control; rotation and tillage studies on dry land; and rotations under irrigation. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[**Field crops and plant breeding research in New York**], T. L. LYON, J. A. BIZZELL, D. B. JOHNSTONE-WALLACE, R. B. HINMAN, J. R. LIVERMORE, H. H. LOVE, F. P. BUSSELL, W. T. CRAIG, R. G. WIGGANS, R. A. EMERSON, M. M. RHOADES, A. C. FRAZER, E. V. HARDENBURG, O. SMITH, and G. C. MOORE ([*New York*] *Cornell Sta. Rpt.* 1934, pp. 64, 65, 66, 99, 100, 126, 127, 129, 131, 132).—Studies for which progress results (E. S. R., 70, p. 762) are given included breeding work with silage corn, wheat, oats, barley, potatoes, and soybeans; cytogenetic studies with corn; potato experiments including fertilizer, cultural, and storage studies, and effects of fertilizer nutrients on yield, growth, and quality of tubers on muck soil; spacing and cultivation tests with field beans; effect of frequency-of-cutting on longevity and growth of alfalfa; and phosphorus and calcium content of pasture in various regions of New York.

[**Field crops experiments in South Carolina**], H. P. COOPER, W. B. ROGERS, R. W. WALLACE, W. R. PADEN, G. M. ARMSTRONG, C. C. BENNETT, C. S. PATRICK, E. D. KYZER, T. M. CLYBURN, J. H. MITCHELL, J. E. LOVE, E. E. HALL, S. J. WATSON, W. B. ALBERT, W. M. LUNN, H. A. MCGEE, J. A. RILEY, L. E. SCOTT, W. A. CARNS, J. M. JENKINS, JR., and W. D. MOORE (*South Carolina Sta. Rpt.* 1934, pp. 16-19, 39, 40, 84, 86-88, 89-100, 103, 104, 105-112, 115-121, 132-135, 140, 141, 142, figs. 7).—Agronomic investigations (E. S. R., 71, p. 36), carried on at the station and substations (in several lines in cooperation with the U. S.

Department of Agriculture) and reported on briefly, included variety tests with cotton, corn, oats, sweetpotatoes, soybeans, lespedeza, crotalaria, castorbeans, and pasture grasses; selection of soybeans; fertilizer studies with cotton comprising placement, time and rate of applying potassium fertilizers, trials of nitrogen carriers, rates of applying sodium nitrate and potassium chloride for side-dressing, tests of brands of sodium nitrate, effects of additions of dolomitic limestone and calcium sulfate on yields of cotton in tests of sources of potassium and of phosphorus, a comparison of a cover crop of rye and vetch with fresh manure in cotton production, and effects of winter legume cover crops on cotton following, with and without sodium nitrate applications; seed treatments and studies in fiber length and distribution in several varieties of cotton; study of potassium needs of grain and hay crops; effect of manganese sulfate on potato yields; tobacco investigations including trials of fertilizer mixtures and placement, effects of natural weed fallow of several common weeds on yield and quality, study on sulfur content and effects of fertilizers high and low in sulfur, and fertilizer formulas again recommended for bright flue-cured tobacco and plant beds; cultural (including planting) tests with cotton, corn, and potatoes; a trial of fiber flax; intercropping of corn and legumes; comparison of soybeans v. corn with soybeans for silage; cutting and grazing tests with *Lespedeza sericea*; adaptation and propagation of pasture grasses; a study of the effect of basic slag and superphosphate on the growth and composition of carpet grass and lespedeza; and a comparison of methods of preparing cut-over coastal land for seeding to carpet grass.

[Field crops experiments on the Belle Fourche (S. Dak.) Reclamation Project Experiment Farm, 1926-32], B. AUNE, L. A. HURST, and A. OSENBRUG (*U. S. Dept. Agr., Tech. Bul. 454* (1934), pp. 8-18, 24-30, 42-52, figs. 3).—Experiments with field crops in cooperation with the South Dakota Experiment Station, reviewed as heretofore (*E. S. R.*, 57, p. 524), for the above period comprised rotation experiments with irrigated crops, including alfalfa, sugar beets, corn, oats, barley, potatoes, wheat, and seed flax, continuous and in different sequences, and also dealing with the effect of manure on crop yields, and the effects of sweetclover and alfalfa on soil productivity and on subsequent crop yields when harvested for hay v. harvested by livestock; establishment of permanent mixed grass pastures; a maximum crop production experiment using methods and sequences producing high yields in the irrigated rotations and other experiments; variety tests with spring wheat, oats, barley, emmer, corn for grain and silage, seed flax, beans, soybeans, and potatoes; and fertilizer experiments with sugar beets. Experiments with crops on dry land were concerned with the influence of climatic conditions on crop production; adaptation of different crops; and the effects of methods of preparing land and of planting, green manures, fallow, and crop sequences on yields.

A comparison of methods of botanical analysis of the native prairie in western North Dakota, H. C. HANSON (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 9, pp. 815-842, figs. 6).—Methods tested in western North Dakota in "mixed prairie" vegetation, consisting of the dominants *Bouteloua gracilis*, *Agropyron smithii*, *Carex filifolia*, *C. stenophylla*, and *Stipa comata*, and evaluated and compared in this contribution from the North Dakota Experiment Station, included the area-list, count-list, weight-list, frequency-abundance, and the point methods. Various sizes and shapes of sample areas and plats also were studied.

The use of sample areas located in plats is recommended in place of sample areas not in plats. The minimum desirable size was found to be 2 by 3 rods containing 24 sample areas, each 0.1 m square (2.5×4 dm). Reliable quanti-

tative results, it is concluded, may be secured when listing is done on sample areas arranged in plats, both in sufficient numbers for systematic treatment. Valuable supplementary information will be furnished by the point and frequency-abundance methods since large areas can be covered quickly by their use. For extensive investigations and where time and assistance are limited, the use of the point and frequency-abundance methods, supplemented by permanent quadrats, is recommended. These conclusions are not to be applied to other types of grassland, as the short-grass plains, true prairie, and bunch grass prairie without further investigation.

Permanent pasture studies on upland soils, E. L. MAYTON (*Alabama Sta. Bul. 243 (1935), pp. 26, figs. 7*).—The effects of fertilizer treatments on pasture plants grown in mixtures on upland Norfolk sandy loam of low fertility at the station were studied during the period 1926–32. The treatments included the standard N, sodium nitrate, 200 lb. annually; P, superphosphate, 600 lb. every 5 yr.; K, potassium chloride, 150 lb. every 5 yr.; and variations therefrom both limed and unlimed. The costs of and returns from different treatments are treated in some detail.

Dallis grass, carpet grass, hop clover, and lespedeza proved to be the most promising pasture plants for sandy upland soils, and Dallis grass predominated in the drier years. Black medic, bur-, white, Ladino, and Carolina clovers proved susceptible to cold, being killed at 8° F., while hop clover successfully withstood this and other low temperatures. Hop clover grew better in combination with Dallis grass than with carpet or Bermuda grass, and lespedeza grew better in combination with Bermuda grass. Centipede grass almost crowded Dallis grass out of an established sod over 5 yr., but yielded considerably less than Dallis grass by the harvest method used (lawn mower with low cutter bar). Dallis grass and carpet grass used together yielded less than when used separately as basic grasses. Pasture plants became established more quickly on limed and on fertilized plats and there were fewer weeds than on untreated plats. The grasses, Dallis, carpet, centipede, and Bermuda, responded directly to nitrogen and the clovers to phosphorus, and Dallis grass and hop clover showed marked responses to lime.

Lime in combination with fertilizer treatments, except with nitrogen alone, materially reduced the cost per ton of increased yields. Plats receiving a high-nitrogen fertilizer produced larger and more uniformly distributed yields than with any other treatment, but at a greater cost per ton of yield. At the prevailing prices of hay and nitrogen over the period 1927–32 the same amount of feedstuff as was produced by nitrogen could have been bought as hay at a lower cost. The P K, $\frac{1}{2}$ N P K, and P treatments in the order named produced material at the lowest cost per ton of increase both with and without lime.

The average seasonal yields of plats for the period were found to be correlated very closely with the average distribution of rainfall with an approximate 20-day time lag. Yields from all plats regardless of fertilizer treatments followed the same general seasonal distribution, showing that periods of low production could not be avoided by the use of fertilizers. Low production around June 1 was due in part to competition of hop clover with young Dallis grass.

A fertilizer test with centipede grass showed that fertilizers produced much smaller increases with this grass than with Dallis, carpet, or Bermuda grass, due in part to the harvest method, since centipede grass makes little upright growth except under very heavy nitrogen fertilization. It forms a very thick sod which seems to inhibit growth to some extent.

The effect of some forms of nitrogen on the growth and nitrogen content of wheat and rice plants, G. THELIN and A. B. BEAUMONT (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 12, pp. 1012-1017).—Marquis wheat and Vintula lowland rice were grown at the Massachusetts Experiment Station in complete nutrient solutions supplied with sodium nitrate, ammonium sulfate, and urea and combinations of sodium nitrate and ammonium sulfate to furnish nitric and ammoniacal nitrogen in 1:3, 2:2, and 3:1 ratios and were harvested in three growth stages. Both cereals assimilated all forms of nitrogen to a certain extent. On the whole, rice thrived better than wheat with ammonium sulfate, although both assimilated nitrogen from ammonium sulfate better in the early than in the later stages of growth. The best growth in all stages was obtained in rice with the 3:1 ratio of nitric and ammoniacal nitrogen and in wheat with the same ratio, except that in the second stage, urea gave the greatest weight. Toxicity of ammonium sulfate was more pronounced with wheat than with rice, increased with age of the plant, and rather closely paralleled the amount of ammoniacal nitrogen found in the plants. Rice exhibited a much higher iron requirement than wheat.

The nodulation and other adaptations of certain summer legumes, J. F. DUGGAR (*Jour. Amer. Soc. Agron.*, 27 (1935), No. 1, pp. 32-37).—In field experiments at the Alabama Experiment Station, 1928-30, wherein a number of the less common summer legumes were compared with those in common use as to promptness of inoculation, relative earliness, luxuriance of growth, palatability, and extent of injury by the Mexican bean beetle and nematodes, only Kobe and Tennessee 76 lespedezas proved superior on the whole to comparable legumes currently in general use. *Crotalaria* spp., *Sesbania macrocarpa*, beggar weed, the lately acclimatized form of *Phaseolus calcaratus*, moth bean, and possibly *Strophostyles helvola* seemed promising enough for further testing.

Root nodule formation as affected by planting of shelled or unshelled seeds of bur clovers, black medic, Hubam, and crimson and subterranean clovers, J. F. DUGGAR (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 919-923).—Shelled and unshelled seeds of several clovers were artificially inoculated and planted in field experiments at the Alabama Experiment Station on Norfolk soils lacking the appropriate nitrogen-fixing micro-organisms. Nodule formation was prompter and generally more intensive, at least during the early seedling stage, following the use of unshelled seed of the bur-clovers and Hubam sweetclover and in some of the plantings of crimson and subterranean clovers. The prompter nodulation from planting unshelled seed was attributed to the bearing of larger amounts of inoculum on the more bulky and rougher surfaces of unshelled seeds than on the smaller and smoother surfaces of shelled seeds. No advantage in initial nodulation came from using unshelled seed where three bur-clovers were planted without artificial inoculation in a soil amply supplied with proper micro-organisms.

Winter legume cover crops for the Coastal Plain of Georgia, J. L. STEPHENS (*Georgia Coastal Plain Sta. Bul.* 23 (1934), pp. 44, figs. 2).—Production practices for winter legume cover crops are recommended from the results of variety, planting, and green manuring experiments made in cooperation with the U. S. Department of Agriculture. Information is included on seed production, diseases and insects, and on other winter legumes.

The Austrian winter pea, monantha vetch, smooth vetch, and hairy vetch, of the varieties of field peas and vetches tried, are deemed best adapted to south Georgia conditions. For best yields, seeding should be made in October, preferably drilling at the rates for Austrian winter peas 40 to 45 lb., monantha vetch 30 to 35 lb., and hairy vetch and smooth vetch 25 to 30 lb. per acre, and the seed

should be covered from 2 to 4 in. Where a grain drill is not available, broadcasting and plowing under or covering with a disk harrow is recommended. While mixing Austrian winter peas and vetch or oats appears to have no advantage in yield where the crop is being grown for hay or grazing, mixing with oats gives variety for grazing and makes hay cutting and curing easier.

The winter cover crop should be turned under at least 15 days before corn or cotton is planted. Corn is considered more desirable to follow the cover crop, especially where the cover crop has been continuous for several years. The use of winter legume cover crops has increased the yield of both corn and cotton. Since Austrian winter peas appear to furnish nitrogen needed by corn or cotton, an incomplete fertilizer is used under corn or cotton in addition to the cover crop, as an 0-9-5 (NPK) for cotton and 0-10-4 for corn. Vetches for green manure should be supplemented with a complete fertilizer, 3-9-5 for cotton and 2-10-4 for corn, to insure maximum yields. Seed production of Austrian winter peas or vetches in south Georgia has not been successful.

Cold resistance of three species of lespedeza compared to that of alfalfa, red clover, and crown vetch, H. M. TYSDAL and A. J. PIETERS (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 923-928).—In controlled freezing tests by the Nebraska Experiment Station, cooperating with the U. S. Department of Agriculture, Korean lespedeza was the least cold resistant of the group tested, common lespedezas next, and perennial lespedeza most cold resistant, while crown vetch had more cold resistance than the lespedezas but somewhat less than alfalfa or red clover. Alfalfa and red clover increased in cold resistance with advance in the stage of growth after the two-leaf stage. When seeds of both were soaked from 1 to 5 days, Korean lespedeza was always more cold resistant than Grimm alfalfa. An average temperature of -4.1°C . (24.6°F .) for 16 hr. proved lethal to all lespedezas. A minimum of -4.5° with an average of -2.8° showed considerable killing of Korean and common lespedezas.

Pasturing alfalfa in Michigan, H. C. RATHER and A. B. DORRANCE (*Jour. Amer. Soc. Agron.*, 27 (1935), No. 1, pp. 57-65).—Experiments by the Michigan Experiment Station at Augusta, Mich., and summarized opinions of 35 farmers experienced in pasturing alfalfa indicated that alfalfa was more desirable for pasture than sweetclover. Its advantages included greater carrying capacity, longer life and grazing season, and higher palatability. It also proved superior to the usual permanent grass pastures on upland Michigan soils because of greater productivity and continued growth during hot dry periods in summer when grasses were relatively nonproductive.

Alfalfa pastured continuously at Augusta proved productive, as did that with the first cutting taken for hay and the subsequent growth pastured. Pasturing the first growth and harvesting the second for hay was less desirable. Heavy grazing of alfalfa in September was injurious, but when it was discontinued by September 1 alfalfa survived winter in nearly as good condition as that from which two cuttings of hay were removed each season. Common precautions used to avoid bloat with cattle or sheep pasturing on alfalfa are noted.

Bur-clover cultivation and utilization, R. MCKEE (*U. S. Dept. Agr., Farmers' Bul.* 1741 (1934), pp. II+14, figs. 7).—This is a revision of Farmers' Bulletin 693 (*E. S. R.*, 34, p. 139), which it supersedes.

The phylogeny of Zea mays, P. WEATHERWAX (*Amer. Midland Nat.*, 16 (1935), No. 1, pp. 1-71, figs. 20).—Evidence on the origin and natural relationships of corn is presented and discussed under the topics of archeology and exploration, geology, taxonomic position, vegetative anatomy, cytology and genetic compatibility, inflorescences, the ear and theories of its origin, phylotaxy, the wild corn plant, species, corn and teosinte, theory of a hybrid origin, and place of origin, and 71 references to the literature are cited.

Cotton and cottonseed, compiled by R. P. LANE (*U. S. Dept. Agr., Misc. Pub. 203 (1934), pp. II+149*).—This is a list of the publications of the U. S. Department of Agriculture on cotton and cottonseed, including early reports of the U. S. Patent Office and embracing 917 references, a list of depository libraries, and a subject and author index.

The breeding of cotton: A bibliographic monograph [trans. title], E. TASCHDJIAN (*Ztschr. Zücht., Reihe A, Pflanzenzücht., 18 (1933), No. 4, pp. 627-672*).—This review of literature covers morphology; biology of the flower; variability, including systematics of *Gossypium*, cultivated varieties, and intra-varietal variation; correlations; mutations; genetics, including a tabular summary of the behavior of different characters in inheritance, chromosome numbers, and linkage; breeding methods; and technic of selfing and crossing. It embraces 160 titles.

Breeding for fiber length regularity in cotton, G. N. STROMAN (*Jour. Amer. Soc. Agron., 26 (1934), No. 12, pp. 1004-1012*).—Percentage of $1\frac{1}{8}$ -plus fibers is defined as the percentage of cotton of $1\frac{3}{8}$, $1\frac{1}{4}$, and $1\frac{1}{8}$ in. in a sample that has been pulled from a cotton fiber sorter. Data from cotton breeding work (E. S. R., 71, p. 315) at the New Mexico Experiment Station show that in the four principal strains reported some progress had been made in breeding for high percentage of $1\frac{1}{8}$ -plus fibers. Strains having a high percentage of $1\frac{1}{8}$ -plus fibers should bring premium prices to the producer, due to such cotton being classed as of high length.

Preliminary studies of the length and uniformity of staple of Louisiana cotton varieties, H. B. BROWN (*Louisiana Sta. Bul. 259 (1934), pp. 8, pls. 5, figs. 2*).—Arrays were made with the Suter-Webb cotton fiber sorter from hand-ginned 10- and 20-lock samples and from 20-lb. machine-ginned (18-saw) samples from each of 20 leading cotton varieties grown in tests on alluvial land at Baton Rouge, and lint from the machine-ginned lots also was submitted to expert cotton classers for stapling. The variations in staple length and the percentages of each length group are shown graphically and discussed for each variety.

The staple length classing given the samples by the classers was usually within the range of length ordinarily given the variety by classers, and the extreme staple length considerably exceeded the commercial length. The modal length of the lint from hand-ginned samples was considerably shorter than the classers' length for short- and medium-length staple varieties, but for most long staple varieties the modal length exceeded the length given by the classers. The classers appeared to be more liberal with the short staple varieties, probably largely because the fibers in the hand-ginned sample averaged longer than in the machine-ginned. The extreme lengths in the two sets of samples differed only slightly, whereas in the percentage of fibers $\frac{7}{8}$ in. and longer the difference was striking, possibly because the gin broke a higher percentage of fibers than did the fingers and because only good bolls were picked for the hand-ginned arrays, while in the other case all bolls on the plants were picked. The value of the fiber sorter to the cotton breeder is pointed out.

Improving the uniformity of cotton fiber by the use of the Pressley sorter, E. H. PRESSLEY (*Arizona Sta. Tech. Bul. 54 (1934), pp. 127-153, figs. 10*).—The Pressley cotton fiber sorter (E. S. R., 69, p. 286), its operation and application, and sampling methods with plants in the field are described, with discussion of data obtained in its use with progenies from a selection of Mebane cotton grown at Tucson.

From the slight correlation found between the degree of butterfly and percentage of lint $\frac{5}{8}$ in. or shorter in 76 of the plants sorted, it was evident that degree

of butterfly cannot be used to determine definitely the relative amount of sub-staple in a number of samples where range of variation is fairly narrow. Discarding selections having the lowest percentage of lint in the modal quarter as determined on the sorter resulted in an increase in lint percentage in the three largest classes of 6.61 percent for 1933 over 1931. Discarding all plants whose lint length varied more than $\frac{3}{4}$ in. from the general average resulted in narrowing the range of individual plant lengths and in an increase of 8.2 percent for 1933 over 1931 in the number of plants with the modal lint length. The average lint length as determined from the sorting data remained the same to the nearest $\frac{1}{4}$ in.

Selection of plants with a high lint index (weight of lint per 100 seeds) resulted in an increase of 0.9 g for 1933 over 1931. This gain was in the modal quarter where the amount of lint increased 1.14 g and was accompanied by a loss of 0.24 g in the combined weight of all other classes. An increase of 1.4 in the lint percentage for 1933 over 1931 was probably caused by the increase in the weight of lint per seed.

The selection for uniformity, as indicated by the amount of lint in the modal quarter, eliminated all individuals representing four of the original nine families. While no families were grown from plants selected for low lint percentage in the modal quarter, the elimination of these four families in competition with the others indicated that heritable variations exist in the different families which may make possible production of more uniform strains.

An array representing fibers recovered from a 30-seed sample sorted on this sorter differed little from another array representing the same sample corrected on the basis of the percentage of lint lost in combing and the lint percentage in each $\frac{1}{8}$ -in. class in the combings.

A regional test of cotton, H. H. LOVE and Y. S. CHEN (*Nanking: Natl. Agr. Res. Bur.*, 1934, pp. 26, fig. 1).—The comparative yields and behavior are shown for numerous native, introduced, and acclimatized foreign varieties of cotton tested at 11 experiment stations in different provinces in China. This article is in both English and Chinese.

Lespedeza, H. B. MUSSER (*Pennsylvania Sta. Bul.* 308 (1934), pp. 10, 11).—A comparison of strains is briefly noted.

Registration of varieties and strains of oats, VI, T. R. STANTON (*Jour. Amer. Soc. Agron.*, 27 (1935), No. 1, pp. 66–70).—Improved varieties of spring oats approved for registration (E. S. R., 67, p. 128) in 1934 and described with records of their performances included Lenroc, derived from Great American (Silvermine type) \times Cornellian, Rusota, a pure line from Green Russian, and Spooner, a pure line from Wisconsin No. 8 (Silvermine type).

Effect of seed injury upon the germination of *Pisum sativum*, H. W. HULBERT and G. M. WHITNEY (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 10, pp. 876–884, fig. 1).—Germination tests and determinations of injuries on thresher-run and drilled peas at the Idaho Experiment Station showed that considerable mechanical loss occurs in harvesting, threshing, cleaning, and drilling seed peas. Mechanical seed injury seriously reduces their value for planting, and germination decreases in proportion to severity of injury. Force-feed drills were observed to cause considerable mechanical injury to smooth-seeded varieties. Graphite applied as a thin uniform coating to seed peas reduced drill injury to a minimum and did not affect germination. Since graphite increased the rate of seeding at a given drill set, the drill must be recalibrated to plant the proper amount of seed. The effects of other treatments to reduce drill injury and eliminate possible molds and fungi are described. Sun-scalded and weevily peas appeared of little value for planting.

Irish potatoes at Georgia Mountain Experiment Station, J. E. BAILEY (*Georgia Sta. Circ. 103* (1934), pp. 8, figs. 2).—Cultural and field methods and harvesting and storage practices considered suitable for growing potatoes in north Georgia are outlined, largely from the results of variety, fertilizer, size-of-seed, thinning, and spraying tests reported on briefly.

Adapted varieties include the early Irish Cobbler, Bliss Triumph, and Snowflake and the late Green Mountain and Jersey Red Skin. Seed 1.5 to 2 oz. in weight should be planted 12 in. apart in 3.5-ft. rows, in well-drained loose soil in which commercial fertilizer high in phosphorus is drilled at the rate of 600 to 1,000 lb. per acre and thoroughly mixed with the soil. Neither liming the soil nor thinning the plants to 1 stem per hill is generally recommended. Spraying with 4-4-50 bordeaux mixture increased yields considerably.

Handling seed potatoes to insure good stands, J. BUSHNELL (*Ohio Sta. Bimo. Bul. 172* (1935), pp. 3-6, figs. 2).—Seed and planting practices indicated from experiments with potatoes include keeping seed warm for early planting and preventing it from sprouting or wilting for late planting, greening it under humid conditions, protecting cut seed from sun and wind, using small whole seed if available, leaving heavy soils loose after plowing, placing fertilizer at the side of but not in contact with the seed, and planting from 3 to 4 in. deep, covering lightly, and gradually filling the furrows as young plants emerge.

Yield results from chilled seed potatoes, E. R. WALLACE (*Jour. Min. Agr. [Gt. Brit.], 41* (1935), No. 10, pp. 956-964, pl. 1).—Seed potatoes exposed to freezing temperatures during rail shipment yielded less than protected controls in comparative tests at the Kirton Experimental Station, the reductions tending to increase with severity of exposure. Even exposure insufficient to cause marked changes in external or internal appearance resulted in reductions as large as when well-marked visible changes occurred.

Studies on blooming in rice, C. R. ADAIR (*Jour. Amer. Soc. Agron., 26* (1934), No. 11, pp. 965-973, figs. 2).—The number of days required for the blooming of all flowers on a rice panicle and the hour of blooming appeared to depend primarily upon the variety, atmospheric temperature, intensity of sunlight, and probably other climatic conditions, according to studies by the U. S. Department of Agriculture and the Arkansas Experiment Station cooperating at Stuttgart, Ark. Fortuna and Caloro rice completed blooming in fewer days and over a shorter period each day than Colusa, Early Blue Rose, and Edith. Edith bloomed faster the first day than did the other varieties. The rate of blooming was fastest during the first 4 days of blooming, and the most flowers bloomed on the second or third day. No flowers observed bloomed before 8 a. m. or after 4 p. m., and the maximum rate of blooming was between 10 a. m. and 1 p. m., being very fast at about 12 m., except in Fortuna in 1931 and Edith in 1933. Uniform temperatures were conducive to rapid blooming. With high afternoon temperatures the number of Caloro flowers that bloomed did not increase as did those of Early Blue Rose and Edith. Blooming began early in the day when temperatures were high and slowed down materially when the day became cloudy and cooler. On cool, clear days blooming began late in the morning and continued until rather late in the afternoon. Most varieties started and stopped blooming earlier in the day when the humidity was high than when it was low, although the effect of humidity was not so marked as that of temperature. Pollen was shed just before or when the flowers opened.

Lodging of straw and its inheritance in rice (*Oryza sativa*), K. RAMIAH and S. DHARMALINGAM (*Indian Jour. Agr. Sci., 4* (1934), No. 5, pp. 880-894, pls. 2).—Examination of pure lines of rice varieties showed that the straw

character varies considerably and varieties can be grouped into lodging and nonlodging types. Except that nonlodging varieties had thick persistent leaf sheaths tightly encasing the bottom internodes which had comparatively greater diameters, there was no single factor serving as an index of lodging. Conditions apart from varietal differences which cause lodging include high initial fertility, early and close planting, and applications of nitrogenous fertilizers. Study of crosses between two lodging varieties and a nonlodging rice suggested probably only a single factor difference. Genetic association was evident between the character of straw and such characters as tillering and duration. Nonlodging of straw was associated with poorer tillering and longer duration. No relation was apparent between straw character and plant height or floret sterility.

The effect of depth of planting on the germination of soybean varieties. R. E. STITT (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 12, pp. 1001-1004).—In studies at the Massachusetts State College on the relationship between depth of planting, soil type, soil temperature, and the size of seed and their effects on germination of Habaro, Ito San, and Illini soybeans, satisfactory stands were secured to depths of 4 in. in fine sandy loam and 2 in. in clay soil, although reduced stands were had from seeding deeper than 2 in. in loam and 1 in. in clay, and germination was prolonged with increased depth of planting. Germination at cool temperatures was slow and resulted in fewer emerged seedlings. Smaller seeded varieties germinated sooner and better at deeper seeding than the larger seeded varieties.

Stubble deterioration of sugar cane. C. W. EDGERTON, E. C. TIMS, and P. J. MILLS (*Louisiana Sta. Bul.* 256 (1934), pp. 27, figs. 4).—Fields suffering from stubble deterioration, the failure of the stubble (ratoon) pieces to produce a satisfactory number of vigorous shoots in the spring, are characterized by poor stands and slow growth. Stand counts on stubble cane in the spring during the period 1928-34 showed the most severe losses from this cause to occur in 1930 and 1934, and the least in 1929 and 1933.

Studies during 5 yr. showed temperature to be an important factor in stubble deterioration. Temperatures below freezing may kill the young shoots, and low temperatures prevent growth and make conditions more favorable for rotting of stubble pieces and young shoots. Lack of cold weather before January, however, may permit early germination of a large proportion of the stubble buds and young shoots may be killed by later freezes. The lack of aeration due to poor drainage lowers the vitality of stubble pieces, deterioration being always more severe in heavy black or in poorly drained soils. The condition of sugarcane at harvest time may also be a factor in spring recovery. On green and growing cane the buds will not start as early as on so-called mature cane. Stubble from cane cut early in the fall sometimes may deteriorate faster than stubble from late-cut cane. Severe injury to the old roots (E. S. R., 65, p. 828) on the stubble pieces which furnish water for the young developing shoots may result in less satisfactory stands. For best results stubble evidently should not be off-barred until a fair stand is visible. The red rot disease (*Colletotrichum falcatum*) is an important factor in stubble deterioration, certain varieties, particularly P. O. J. 213 and C. P. 807, being very susceptible. The advisability of stubble shaving, a practice closely related to deterioration, appeared to depend on the condition of stubble pieces and the location of the good buds thereon.

Varieties have been affected differently by the various stubble-deterioration factors. P. O. J. 213 and P. O. J. 234 seemed to be most susceptible and were considered dangerous canes, not to be planted in regions where deterioration

is apt to occur. Co. 281, Co. 290, and P. O. J. 36 were found to be the most resistant of the present commercial canes, and the new varieties C. P. 28-11, C. P. 28-19, and C. P. 29-320, also seemed to be very resistant. A method developed for determining resistance to stubble deterioration enables one to determine in a good or bad year whether a new variety is resistant.

Registration of improved wheat varieties, VIII, J. A. CLARK (*Jour. Amer. Soc. Agron.*, 27 (1935), No. 1, pp. 71-75).—Varieties of wheat approved for registration (E. S. R., 68, p. 614) in 1934 included Relief, Rio, Rex, Thatcher, and Sturgeon. Brief descriptions and records of performances are given.

English wheat varieties.—I, Classification. II, Development of the wheat plant, P. S. HUDSON (*Ztschr. Zücht., Reihe A, Pflanzenzücht.*, 18 (1933), No. 4, pp. 505-525, figs. 2; 19 (1934), No. 1, pp. 57-108, figs. 49).—Varieties of wheat commonly grown in England are classified and described with determinative keys and remarks on commercial and agricultural features, the merits of diagnostic characters, and earlier classifications. Part 2 of the paper gives an account of the complete morphological history of the wheat plant in all stages from germination to maturity and its bearing on factors determining yield, especially fertilizers and spacing, and the relative productivity of varieties with different growth habits.

Investigations on yield in cereals.—VIII, Hybrid vigour in wheat, F. L. ENGLENDOW and B. P. PAL (*Jour. Agr. Sci. [England]*, 24 (1934), No. 3, pp. 390-409, figs. 3).—In the eighth of this series (E. S. R., 63, p. 437), hybrid vigor, as indicated by yield of grain and tillering, was studied in the cross of Little Joss × Thule wheat (both *Triticum vulgare*) in F_1 , F_2 , and F_3 , and on a small scale in 56 crosses between *T. vulgare* varieties and in 38 interspecific crosses and in several barley crosses.

Hybrid vigor was evident in Little Joss × Thule, and differences were established in F_1 between its reciprocal directions; in F_2 the difference was slight and F_3 's were identical in vigor, making factorial explanation of hybrid vigor difficult to accept.

Results of observations on the wide range of crosses showed that a restricted optimum period for crossing existed in some varieties, and certain wheats regularly proved more successful as female than as male parents. In crosses of common wheats the actual crossed grain was usually heavier than that of one parent and often heavier than either, but with interspecies crosses a decrease instead of an increase was found in most cases. While an F_1 of greater tillering capacity and yield than its parents resulted from most crosses, there were important exceptions, and certain varieties stood out as good or bad in vigor of F_1 progeny when used as male parent or female or in both directions of crossing. Physiological experiments indicated that Ashby's explanation of hybrid vigor in corn F_1 's (E. S. R., 68, p. 602), as resulting solely from the greater embryo weight of the crossed grain, was inapplicable to wheat. No increase over parental embryo weight occurred. From examination of all published cases it appeared that hybrid vigor occurs preponderantly in crosses among parents which are diploid, naturally out-pollinating, and endospermic in seed.

Studies on the critical period for applying irrigation water to wheat, D. W. ROBERTSON, A. KEZER, J. SJOGREN, and D. KOONCE (*Colorado Sta. Tech. Bul.* 11 (1934), pp. 43, figs. 11).—Marquis wheat, irrigated at different stages of development compared with no irrigation, distributed irrigation, and enough water applied to keep it growing, in experiments covering the period from 1921 to 1929, required enough moisture throughout the season to produce normal growth. It made its highest yield and used water most efficiently when irri-

gated at the jointing or heading stage with only a 6-in. application. Although higher yields and more efficient use of water were obtained when a small quantity of water was applied at frequent intervals or distributed, such irrigation was not considered feasible in field practice. Irrigations made in one year were found to have a carry-over effect on the crop in the next year. When no water was applied in the second year the highest yield was obtained from plats irrigated at the filling stage in the first year; the second highest yield from irrigation at heading; the third highest at jointing; and the lowest at germination. Residual yield was correlated with soil moisture of the preceding fall. The root development was shown by root penetration studies to vary with the treatments. Fewer roots were found in the third- and fourth-foot depths of the heading, blossoming, and filling plats than in the germination, tillering, and jointing plats. (See also earlier notes, E. S. R., 58, p. 223; 71, p. 190.)

HORTICULTURE

[**Horticultural studies by the Arkansas Station**] (*Arkansas Sta. Bul. 312* (1934), pp. 40-44, 45-47).—There are presented the results of studies of the chromosome number and behavior and of pollen tube development in the apple, the pruning of the apple, and the fertilization of the peach, all by J. R. Cooper and C. B. Wiggins; the effects of nitrogen, phosphorus, and potassium on the composition of tomato plants, by G. Janssen, R. P. Bartholomew, and V. M. Watts; the response of vegetable crops to variation in the soil reaction, the pruning and training of tomatoes, and tomato variety trials, all by Watts; the disbudding of apple trees in the nursery row, training of peach trees, and the causes of uneven ripening in the Concord grape, all by Wiggins; the fertilization of the strawberry, the penetration of fertilizers into the soil, and the root distribution of the apple, peach, and cherry, all by Cooper; and the fertilization of the tomato, cantaloup, cucumber, and watermelon, by Cooper and Watts.

[**Horticulture at the Colorado Station**] (*Colorado Sta. Rpt. 1934*, pp. 20, 21).—Results are briefly noted from investigations in onion breeding and storage, development of head lettuce strains resistant to tipburn, and orchard management.

[**Horticulture at the Georgia Coastal Plain Station**] (*Georgia Coastal Plain Sta. Bul. 24* (1934), pp. 67-76, 79-92, 108-115).—Among investigations discussed are variety, cultural, and fertilizer trials with tomatoes, watermelons, lima beans, asparagus, and other truck crops and variety tests of peaches, pecans, plums, pears, grapes, figs, jujubes, blueberries, etc. In addition information is presented on studies at the Coast Station at Darien, including fertilizer, cultural, and varietal trials with tomatoes, cabbage, lettuce, and snap beans and variety trials with miscellaneous fruit and vegetable crops.

[**Horticulture at the Iowa Station**] (*Iowa Sta. Rpt. 1934*, pp. 139, 140, 152, 154-162, 163, 164, figs. 4).—Among studies for which data are reported are inheritance of fruit size and shape in tomatoes, by E. W. Lindstrom; storage of gladiolus corms, and breeding of improved varieties of chrysanthemums, carnations, and amaryllis, both by E. C. Volz; methods of propagating apples on their own roots, growing uniform stocks for propagation of standard varieties of apples, development of desirable new stocks, particularly dwarfing stocks, for apples, systems of soil management for apple orchards, adaptation of strawberry varieties with special reference to southeastern Iowa, and responses of strawberries to various soil treatments with special reference to southeastern Iowa,

all by T. J. Maney and B. S. Pickett; correlation of bound water in apple wood with hardness, and hybridization of black raspberries to secure anthracnose-immune varieties, by Maney; responses of different varieties of apples to different storage temperatures, and effects of continued application of nitrates on the composition of apples and their keeping qualities, both by H. H. Plagge; apple breeding and variety studies, by H. L. Lantz, Pickett, and Maney; pear, plum, and cherry breeding, by Pickett and Lantz; improved varieties of peaches, by Maney and Lantz; pruning practices in the grape, by Maney and Plagge; propagation of black raspberries and apples, by Pickett, V. T. Stoutemyer, and Maney; natural and cool air storages for apples, by Pickett, Plagge, and H. Giese; sweet corn breeding, and asparagus culture, both by E. S. Haber; cucurbit breeding, and the place of fertilizers in a truck crop program for sandy soils in southeastern Iowa, both by A. T. Erwin; the possible association of vitamin A with nutritional conditions in coleus, by Haber, P. M. Nelson, and P. P. Swanson; and varietal studies with beans and tomatoes, by Erwin and Haber.

[**Horticulture at the Nebraska Station**] (*Nebraska Sta. Rpt.* [1933], pp. 13, 14, 15, 33, 34, 36, 37).—Brief comments are presented on the results of studies of pruning of apple trees; varieties of strawberries and gooseberries; cultural treatments for apples and grapes; understocks for apples; development of apple root systems; effects of crown size, duration of cutting period, mulching, salt, and depth of planting in asparagus; and cultural, fertilizer, and source effects on vegetables.

Brief comments are also given on the performance at the North Platte Substation of jack, western yellow, Scotch, and Austrian pines, Black Hills spruce, Russian-olive, hackberry, American and Chinese elms, honeylocust, and Colorado blue spruce. Variety tests with vegetables at the Scotts Bluff Substation are discussed, and the behavior of American and Chinese elms, boxelder, and honeylocust at the Valentine Substation is briefly considered.

[**Horticulture at the Pennsylvania Station**] (*Pennsylvania Sta. Bul.* 308 (1934), pp. 16, 19, 20).—Information is presented on the results of studies on the use of synthetic mushroom compost, by J. W. Sinden; ultraviolet radiation for turnips, by H. W. Popp; lettuce breeding, by M. T. Lewis; vegetable fertilization, by W. B. Mack; varieties of edible soybeans, tomatoes, and garden peas, by Mack and G. J. Stout; the comparative merits of electricity, manure, coal, and kerosene oil for heating hotbeds, by Mack, J. E. Nicholas, Stout, and D. C. Sprague; and winter injury to peaches, cherries, and raspberries, by R. H. Suds.

[**Horticulture at the South Carolina Station**] (*South Carolina Sta. Rpt.* 1934, pp. 73-77, 112-115, 121, 122, 136-138, 139, 140, figs. 3).—Work at the main station included apple pollination and sterility studies, by A. M. Musser and F. S. Andrews; factors influencing yield of Fordhook lima beans, vegetable variety studies, and breeding of spineless okra, all by Andrews; and the testing of a promising new peach (Gage), by Musser.

Studies reported from the Sandhill Substation dealt with variety studies with peaches and grapes, by L. E. Scott, and responses of cucumbers and squash to calcium, basic slag, and potassium, by H. P. Cooper, Scott, and R. W. Wallace.

The following studies conducted at the Truck Substation are briefly discussed by J. M. Jenkins, Jr.: Breeding of garden beans and cabbage; fertilizing of garden beans and tomatoes; variety testing of vegetables; time of planting bush beans; spacing experiments with cabbage; adaptability trials with Satsumas and other citrus, and varietal trials with strawberries.

[**Horticulture at the Belle Fourche (S. Dak.) Field Station**], B. AUNE, L. A. HURST, and A. OSENERUG (*U. S. Dept. Agr., Tech. Bul. 454 (1934), pp. 31-38, figs. 6*).—Included are reports on tests of various trees and ornamental shrubs conducted on dry and irrigated land in cooperation with the Division of Dry Land Agriculture and the Forest Service, of apple and plum varieties for home orchards, and of vegetable varieties for the home garden.

Influence of materials and colors upon plant temperatures within bags, O. H. PEARSON (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 501-506, fig. 1*).—Temperature readings taken by the California Experiment Station on tomato leaves enclosed in bags of glassine, cellophane, white bond paper, manila, and muslin indicated that muslin is effective in lowering temperature, and that glassine and cellophane tend to raise temperatures above that of unenclosed leaves. Colored cellophane bags were slightly cooler than colorless where sufficient leaf tissue was enclosed, whereas in the case of colored bond paper bags temperatures were slightly higher. The possible bearing of temperature differences in the bags on the set of seed is briefly discussed.

New methods of heating hotbeds, G. J. STOUT (*Rural New Yorker, 94 (1935), No. 5315, p. 83, figs. 2*).—At the Pennsylvania Experiment Station five media, namely, fermenting manure, electricity, anthracite coal, kerosene oil, and gas, were compared for heating hotbeds in which were sown cabbage and tomatoes. Germination and growth in all the beds were fairly satisfactory, with the manure producing somewhat the best plants. The temperatures were slightly lower in the kerosene (hot air) and manure heated beds. In the electrically heated beds resistance cables proved more satisfactory than did Mazda lamps. As to costs of operation, computed on the basis of one sash for 30 days, coal (hot water) and kerosene were the most economical when all materials were purchased at prevailing prices. The author points out that local variations in costs should be considered, and also that the number of beds in operation would be an important factor in justifying the initial investments.

[**Vegetable production studies by the Cornell Station**] ([*New York Cornell Sta. Rpt. 1934, pp. 98, 99, 100, 125, 126, 127-129, 130, 131, 132*]).—Brief reports are presented on the following studies: Cabbage breeding, by C. H. Myers; bean breeding, by R. A. Emerson; celery breeding, by Emerson and S. Singh; premature seeding of onions, by H. C. Thompson, O. Smith, and H. L. Cochran; premature seeding of lettuce, by Thompson and J. E. Knott; premature seeding of spinach, fertilizers for onions, and effect of copper sulfate on color and thickness of onion scales, all by Knott; soil reaction for vegetables, and fertilizers and manures for asparagus, both by P. H. Wessels; handling and storage of vegetables, by Thompson, Knott, H. Platenius, and F. S. Jamison; effect of environmental factors on carrots, by Thompson and W. C. Barnes; and color development in vegetables, by Smith.

Machine placement of fertilizers applied to snap beans in Florida, G. H. SERVIS (*Fla. State Hort. Soc. Proc., 47 (1934), pp. 39-41, pl. 1*).—Using three different fertilizer mixtures and nine different placements in relation to seed, it was found that in general the best stands, most rapid growth, earliest blooming and setting, and largest yields were obtained when the fertilizer was placed either in a band 2 or 4 in. to each side of the seed and 1.5 in. below the seed level or in a band 3 in. directly below. Seeds failed to germinate when the fertilizer mixture was applied at planting in contact with the seed.

Soil treatment for Brassicæ.—I, The effect of sterilisation of the soil by mercuric chloride on the seedling growth of brussels sprouts, R. M. WOODMAN, G. H. BRENCHLEY, and F. HANLEY (*Jour. Soc. Chem. Indus., Chem. and Indus., 53 (1934), No. 4, pp. 35T, 36T*).—Determinations at Cambridge Uni-

versity of the dry weights of the tops and roots of brussels sprouts sown in boxes of soil sterilized previous to planting with the usual concentrations of mercuric chloride solutions indicated that the chemical reduces the weight of both tops and roots of the young plants. With low concentrations the roots were affected more than the tops, thus distorting the normal root-top ratio. With higher concentrations both roots and tops were severely affected, the resulting ratios approximating those of small control plants.

Louisiana Copenhagen cabbage: Methods of breeding and description, J. C. MILLER (*Louisiana Sta. Bul.* 260 (1934), pp. 12, figs. 7).—Preceded by an account of the selection and breeding methods employed, a description is presented of a new strain of Copenhagen cabbage developed at the station and named Louisiana Copenhagen. As compared with the usual commercial stocks, the new cabbage is distinguished by smaller size, greater compactness, much shorter cores, greater uniformity in ripening and type, and much greater resistance to premature flowering.

Collards: A truck crop for Louisiana, J. C. MILLER (*Louisiana Sta. Bul.* 258 (1934), pp. 8, figs. 2).—Briefly discussing the cultural requirements of collards, the author states that breeding studies at the station have resulted in the development of an improved strain to be known as Louisiana Sweet collards.

Crossed sweet corn, D. F. JONES and W. R. SINGLETON (*Connecticut State Sta. Bul.* 361, Sup. (1934), pp. 13).—In this supplement to Bulletin 361 (E. S. R., 71, p. 477) comparative yields and brief descriptive comments are presented on a large number of sweet corn hybrids and varieties tested at the Mount Carmel farm in the summer of 1934. Among the later-maturing corns Golden Cross Bantam remained the standard for quality, productiveness, and resistance to bacterial wilt.

Yield comparisons of hybrid and open-pollinated varieties of sweet corn, E. S. HABER (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 8, pp. 704-713).—Comparisons at the Iowa Experiment Station of commercial stocks of yellow and white sweet corns with first generation hybrids between selected inbred lines showed in most cases marked superiority in yield in favor of the hybrids. In addition the hybrids were superior in resistance to various diseases, ripened more uniformly, and produced more uniform ears. The variety Country Gentleman was not increased in yield by recombining inbred lines.

The effect of temperature and photoperiod on the growth of lettuce, H. C. THOMPSON and J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 507-509).—White Boston lettuce plants grown for 1 mo. in houses of approximately 40°-50°, 60°-70°, and 70°-80° F. were divided into three lots and thereafter grown at temperatures of 50°-60°, 60°-70°, and 70°-80°. Part of each lot was given additional light to a total of 15 hr. daily. At the highest temperature no heads formed regardless of previous temperature or length of day. In the 60°-70° house all plants formed satisfactory heads with both light periods. However, under a long day the plants originally exposed to 40°-50° F. developed 100 percent of leaf stalks sooner than the 70°-80° lot. In the 50°-60° house growth was slow, but all plants, except those that had been in the 40°-50° chamber, developed satisfactory heads. In this house exposure to 15 hr. of light increased the size of plants. The results suggest that high temperatures during the early stages may be largely responsible for the production of seed stalks in the fall lettuce crop.

Effect of light and temperature on lettuce varieties [trans. title], W. RUDORF and G. STELZNER (*Gartenbauwissenschaft*, 9 (1934), No. 2, pp. 142-153, figs. 3).—At the University of Leipzig seedlings of six varieties of lettuce, two forcing, two winter, and two summer sorts, grown from seed sown June 25 were

exposed for different periods to day lengths of 16.5, 12, and 8 hr. The summer varieties did not respond to the change in photoperiod, but in the forcing and winter varieties abbreviation of the day diminished and even partly removed the tendency to shoot to seed. The shorter the photoperiod and the longer the treatment period the greater were the effects. The value of the heads for eating purposes was greater with 12- than with 8-hr. days. The two varieties unaffected by day length with respect to seed formation produced heavier heads with 12-hr. days. Germinating seeds of the six varieties after holding for 2 days at 25° C. in filter paper were held in the dark for 10 days at +5° and -5°. The below-zero treatment resulted in a retarded development after planting in the field and a considerable increase in average weight of heads.

Sex ratios and fruit production studies in bush pumpkins, G. W. SCOTT (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 520-525).—Working with White Bush Scallop, Zucchini, and Giant Summer Crookneck varieties of *Cucurbita pepo* planted at different dates in May, June, July, and August, the California Experiment Station observed no consistent variation in the average sex ratios of the different plantings. The weekly ratios of any given planting reached a high point near the early part of the season and gradually decreased toward the end of the flowering period. The daily photoperiod is believed not to have been a limiting factor to flower production in these experiments, and it is also emphasized that the fruits of these squashes are removed in an immature stage. The total weight of fruit per plant increased as they were allowed to attain greater maturity.

Some abnormalities in the flower and fruit of *Lycopersicum esculentum*, L. HAVIS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), p. 512).—Great variation was observed in different varieties of tomatoes with respect to size, shape of fruits, and number and form of the flower parts. In one case the stamen contained six pollen sacs instead of the usual four and two vascular bundles instead of the usual one.

Factors affecting the production of wrinkled tomato fruits, V. M. WATTS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 513-517).—Observations at the Arkansas Experiment Station on the ovaries of Nittany tomato plants grown at mean temperatures of 76.6°, 68.3°, and 58.3° F. showed a definite tendency for low temperature to induce fasciation. Hardening of plants by the procedure of reducing the water supply resulted also in the fasciation of buds which had not reached the stage of stamen initiation and led to the conclusion that hardening of any type is inadvisable for the tomato. Further observations on Earliana, Bonny Best, Globe, and Marglobe indicated that neither age nor size is a useful index to the time of initiation of the first cluster of flower buds, but that the number of true leaves over 0.5 in. in length present when the buds are first visible with the aid of a hand lens is a reliable index.

Pruning greenhouse tomatoes, A. P. DYE (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), p. 510).—Comparing different methods of training greenhouse-grown Bonny Best tomatoes, it was found over 4 yr. at the West Virginia Experiment Station that plants grown with two main stems so separated that each has 12 in. of space were more productive than single-stem plants or double-stem plants trained to a single upright.

Tomato wrapping and quality, J. B. EDMOND (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 518, 519).—An examination at the Mississippi Experiment Station of the juices of Marglobe tomatoes, harvested in the green-ripe stage, enclosed in standard tomato wrapping paper, and held in ventilated chambers at 85° to 96° F. until soft ripe, showed that titratable acidity, pH, free reducing substances, total solids, and the ratio between free reducing substances and acid

were much the same as in unwrapped controls. The author suggests that Mississippi growers need not fear that wrapped tomatoes will develop poor quality provided adequate ventilation is given in transit.

Pollen germination and development in the watermelon, C. F. POOLE and D. R. PORTER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 526-530, figs. 2).—Studies conducted by the California Experiment Station on sectioned ovaries of flowers pollinated at different times showed that the pathway of the pollen tubes from the stigma to the ovary was confined apparently to the conducting tissues as long as such existed and thereafter along the cavity walls of the lobes. Up to 7 hr. after pollination none of the tubes had reached the ovules. As to time of day for pollination, it was apparent that the rate at which pollen grains germinated on the stigma was influenced by prevailing temperatures and decreased as the temperature increased. The rate of movement through the conducting tissues was, however, apparently independent of external temperatures.

Results of sixty years of work of breeding new varieties of fruit, I. V. MICHURIN (*Itogi Shestidesiutiletikh Rabot po Vyvedeniū Novykh Sortov Plodovykh Rastenii*. [Leningrad]: Ogiz Sel'khozgiz, 1934, 3. ed., rev., pp. 367, pls. 33, figs. 255).—This, a third and revised edition, discusses the underlying principles and technic employed and presents descriptions of new varieties of apples, pears, quinces, cherries, plums, apricots, and berries obtained by breeding.

The development of fruit culture in Finland [trans. title], M. JORTIKKA (*Acta Agr. Fennica*, No. 30 (1934), pp. 123, figs. 38; *Ger. abs.*, pp. 112-122).—Stating that the sour and sweet cherries and the domestica and damson plums do not grow wild in Finland but that black, red, and white currants and gooseberries may be found endemic in southern Finland, the author traces the introduction of cultivated varieties of fruits and the development of nurseries and orchards. Mortality is said to be excessive, especially in young trees, due to the occasional critical winters, but losses were observed to vary with soil drainage and nutritional conditions.

Iodized wraps for the prevention of rotting of fruit, R. G. TOMKINS (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 4, pp. 311-320).—At the Low Temperature Research Station, Cambridge, iodine-impregnated paper wraps were found to reduce the attack of molds on grapes and tomatoes without impairment of appearance or flavor. The rotting of apples, plums, and peaches was reduced by wrapping, but certain varieties were adversely affected in appearance and in ripening. In the case of green-ripe tomatoes no appreciable increase or decrease was recorded in the respiration nor in the manner in which the rate changed.

[Pomology studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1934, pp. 112-115).—Studies discussed in some detail include spray residue removal, by W. T. Pentzer and D. B. Carrick; a survey of the 1933-34 winter injury to fruits, by L. H. MacDaniels and A. J. Heinicke; a method of differentiating fruit soils, and nature of soils in the Westfield vineyard area, by J. Os-kamp and L. P. Batjer; hand pollination of fruits, by MacDaniels; activity of leaves of fruit trees, by Heinicke, M. B. Hoffman, and J. G. Waugh; and influence of available nitrogen on root growth, by Heinicke.

Random notes on fruit tree rootstocks and plant propagation, H. B. TUKEY and K. D. BRASE (*New York State Sta. Bul.* 649 (1934), pp. 22, figs. 10).—The clonal rootstock U. S. D. A. 227 was found congenial with Baldwin, Northern Spy, Macoun, and Early McIntosh but not with Delicious and McIntosh. There appeared to be no relation between chromosome or genetic make-up of the stock and scion and congeniality.

Whereas black raspberries rooted very well and purple varieties occasionally from leaf-bud cuttings, red varieties failed to root at all with this method. It is believed that success is associated with the presence of root primordia in the cutting.

Stooled quinces from which the rooted shoots were removed in early fall were killed by severe winter cold, whereas neighboring undisturbed stocks exhibited no injury. Apparently the early defoliation and its influence on food movement and reserves was a factor in the injury.

Peat moss was found an excellent cover for fruit tree seed planted in heavy soil.

The cutting back of dormant-budded roses just above the node immediately after planting gave much better results than partial or delayed removal of the tops.

French pears, including seedlings of the horticultural varieties Winter Nelis and Bartlett proved to be excellent understocks for Anjou, Bartlett, Kieffer, and Seckel. *Pyrus calleryana*, *P. ussuriensis*, and *P. serotina* were inferior stocks except for Kieffer. *P. betulaefolia* gave promise as a superior stock for Seckel, Bartlett, and Kieffer but not for Anjou.

Starting the orchard, T. J. TALBERT (*Missouri Sta. Circ. 181 (1934), pp. 16, figs. 5*).—Useful suggestions are presented relative to the purchasing of nursery stock; handling of the stock; planning, planting, and pruning of young trees; early care of young trees; soil management; spraying; protection against rodents; etc.

Apples for north Georgia, J. E. BAILEY (*Georgia Sta. Circ. 104 (1935), pp. 3*).—Helpful information is presented on planting, culture, pruning, spraying, and other operations.

Apple understocks [trans. title], Ī. P. STOICHKOV (J. P. STOITSCHKOFF) (*God. Sofisk. Univ., Agron. Lesov. Fakult. (Ann. Univ. Sofia, Facult. Agron. et Sylvic.)*, 12 (1933-34), pp. 522-546; *Ger. abs.*, pp. 545, 546).—A discussion is presented of the results of studies of the root systems of 21 varieties of apple understocks, 13 of one species and 8 of another. Marked variation was noted in the capacity of the various stocks to root from cuttings.

Pollination of apples.—III, **Pollination experiments with apples at Alnarp 1931-33**, E. JOHANSSON; IV, **Relation of pollination to seed formation**, E. JOHANSSON; V, **Compatibility of certain varietal combinations** [trans. title], E. JOHANSSON and G. CALLMAR (*Sveriges Pomol. För. Årsskr.*, 35 (1934), No. 4, pp. 245-261; *Eng. abs.*, pp. 258-260).—Further studies at Alnarp, Sweden (E. S. R., 72, p. 337) indicated that most apple varieties are unable to produce a full crop without cross-pollination. The Danish variety Filippa proved to be a satisfactory pollinizer for many other varieties. Almost complete intersterility was again observed in the Ribston × Cox Pomona combination. Gravenstein (triploid) × Ribston (triploid) produced poorly, apparently because of the irregular number of chromosomes. In some instances Ontario apples produced in selfing experiments were found to be without seeds.

Cross-pollination trials with bud mutations of the apple, O. EINSER (*Gartenbauwissenschaft*, 9 (1934), No. 2, pp. 157, 158).—Cross-pollination experiments at the New York State Experiment Station between various of the newer apple sports and their parents showed the expected incompatibility in all except one instance, namely, Van Buren red Duchess crossed with Duchess (Oldenburg) and with Daniel red Duchess. The Daniel red Duchess × Duchess combination set no fruit. These are said to be the first known cases of cross fruitfulness between parents and sports. The Van Buren red Duchess is described as somewhat different in shape as well as in color from the parental variety.

Time during which fruit-bud formation in apples may be influenced in the Shenandoah-Cumberland fruit districts, J. R. MAGNESS, L. A. FLETCHER, and W. W. ALDRICH (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 313-318, figs. 2).—Beginning in late May and extending until September, branches of York Imperial, Delicious, and Jonathan carrying approximately equal amounts of fruit in relation to their foliage were adjusted by fruit thinning to leave 100 leaves per apple and then ringed to prevent translocation of synthesized nutrients. Observations the succeeding spring showed 80 percent or more of all growing points forming fruit buds on branches ringed in early June. After June 15 there was a slight reduction, and a sharp drop followed where the treatment had been delayed until the end of June. There was considerable difference in the behavior of varieties and of the same variety in different years. Since even on ringed branches with abundant foliage fruit bud formation could be influenced for periods of not more than 60 to 90 days following blooming, it is suggested that fruit thinning should be done early if effects on subsequent fruiting are desired.

The period of blossom bud differentiation in the Yellow Bellflower and Kasseler Reignette apples, J. P. STOITCHKOFF (*Izv. B'lgarsk. Bot. Druzh. (Bul. Soc. Bot. Bulgarie)*, 6 (1934), pp. 114-116).—Observations on buds collected from 12-year-old Yellow Bellflower and Kasseler apple trees showed that under the environment prevailing at Sofiya (Sofia), Bulgaria, the greater part of the buds differentiate during a rather brief period. In the Kasseler 72.5 percent of the differentiation occurred between July 8 and August 2 and in Yellow Bellflower between June 21 and August 8. After August 2 and August 8, respectively, differentiation proceeded rather slowly to the end. The duration of the differentiation period was shorter in sod-grown than in tilled trees.

The seasonal cycles of nitrogenous and carbohydrate materials in fruit trees.—II, The seasonal cycles of alcohol soluble materials and of carbohydrate fractions and lignin in the wood, bark, and leaves portions of terminal shoots of apple trees under two cultural systems—grass plus annual spring nitrate and arable without nitrogenous fertilizer, E. S. SMYTH (*Jour. Pomol. and Hort. Sci.*, 12 (1934), No. 4, pp. 249-292, figs. 21).—In this second contribution (E. S. R., 72, p. 479) the author follows the seasonal changes in alcohol-soluble matter, sugars, starch, hemicellulose, cellulose, and lignin in the wood and bark of terminal shoots of Newton Wonder apple trees growing in sod and under tillage. In general the cycles for constituents in the bark and wood were similar, nor did the cultural methods exert wide influence. The grass plot carbohydrate-nitrogen ratio was generally higher than that of the cultivated plats. It was the reverse of results secured for carbohydrate fractions when considered without reference to nitrogen. Sugar and starch contents were consistently higher in the bark than in the wood, thus supporting the accepted view that the bark is the chief organ of carbohydrate translocation. Sucrose was found to reach a minimum in June and like reducing sugars reached the maximum at the end of January. The maximum starch was found at the end of October with minimums in January and June. There was no complete disappearance of starch at any time.

Statistical analysis of some causes of yield variations in the variety Baldwin, S. R. LEVERING (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 306-308).—Statistical analyses of data collected in 109 western New York Baldwin orchards over 40 yr. old showed that of the four factors affecting yield, namely, spraying, leaf area, pruning, and soil quality, spraying effectiveness was most important. The 2 yr. of the study were characterized by heavy scab and codling moth attacks. Following in order of importance are leaf area, soil, and pruning. Soil is conceded of greater importance than indicated because of the

fact that orchards on good soil are sprayed more thoroughly and are more vigorous. A correlation of -0.27 ± 0.09 was computed between yield and average number of seeds in Baldwin. No correlation (-0.09 ± 0.06) was found between yield and proximity to Lake Ontario, all orchards considered being within 10 miles. The size of fruits was highly correlated (0.68 ± 0.03) with yield.

Leaf weight per spur correlated with the yield of the Baldwin apple, S. R. LEVERING (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 303-305).—The average oven-dry weight of leaves from 100 spurs, 10 from each of 10 representative trees, was found by the [New York] Cornell Experiment Station to be a useful index to the producing capacity of apple orchards. Correlation coefficients computed between leaf weights and average yields for a 2-yr. period were highly positive. As compared with leaf area determinations, leaf weighing was much more rapid and is believed to give as true a picture of vigor and possibly also a photosynthetic activity.

The cost of producing United States standard grades of apples as influenced by orchard practice, H. W. THURSTON, JR., H. N. WORTHLEY, F. N. FAGAN, and J. E. MCCORD (*Penn. State Hort. Assoc. Proc.*, 75 (1934), pp. 67-75, figs. 3; *abs. in Pennsylvania Sta. Bul.* 308 (1934), p. 30).—"The cost of producing United States standard apple grades was used as a yardstick for measuring the relative efficiency of spraying and dusting on Rome and Baldwin. The results of 5 yr. showed a greater margin of profit from spraying than from dusting. With Rome this is explained by the combination of lower cost of spraying and the higher percentage of packed fruit from the sprayed blocks. With Baldwin the lower cost of spraying, together with a favorable price for the low grade fruit, made a margin of profit in favor of spraying, in spite of a slightly higher percentage of culls."

Causes of cull apples, G. C. SCHOWENGERDT, D. C. WEST, and A. E. MURNEEK (*Missouri Sta. Bul.* 343 (1935), pp. 22, figs. 9).—This is a revision of an earlier noted bulletin (E. S. R., 69, p. 55).

Factors influencing the refrigeration of packages of apples, J. W. LLOYD and S. W. DECKER (*Illinois Sta. Bul.* 410 (1934), pp. 13-50, figs. 14).—Utilizing a special apparatus constructed to simulate conditions occurring in refrigerator cars but providing accurate control of temperature and air velocity, the authors found that lined tub bushel baskets of Grimes Golden apples developed comparatively large temperature gradients between the outer and inner rows of fruit during the early part of the cooling period. However, as cooling proceeded, the temperatures became more nearly uniform throughout. The temperature difference between individual apples in a lined tub basket and the surrounding air was small. In more open packages, such as wire-bound slat crates, the air temperature was lower than that of nearby fruits. As the air velocity was increased lowering of the temperature of the fruit was more rapid, due apparently to the lowering of the air temperature surrounding the fruit. Air velocities below 100 ft. per minute were not sufficient to affect the rate of air movement within a lined tub bushel basket and did not influence the rate of cooling of the apples provided air temperatures remained constant. Under comparable conditions, the higher the temperature of the fruit when packed the more rapidly the temperature declined. The size of apples was not a factor in the rate of cooling in lined tub baskets. As to type of container, fruits in lined western boxes and in unventilated corrugated bushel boxes cooled more slowly than that in lined tub baskets, and that in the lined tub baskets much more slowly than that in wire-bound slat crates. Oil wraps delayed cooling.

Relation of maturity and handling of Bartlett pears in the Pacific Northwest to quality of the canned product, B. D. EZELL and H. C. DIEHL (*U. S. Dept. Agr., Tech. Bul. 450 (1934), pp. 24, figs. 3*).—Stating that Bartlett pears held in cold storage for a period of 15 to 30 days had better color and texture when subsequently canned than did fruit ripened and canned immediately after harvest or fruit held longer in storage, studies were made of the proper stages of maturity for harvesting and the best temperature for holding pears designed for canning. Observations on fruits picked at successive stages of maturity, as indicated by the pressure tester, showed that pears intended for canning give the best product when harvested between 17 to 15 lb. on peeled surfaces. Pears harvested at higher pressure tended to lose weight rapidly in the ripening room and often wilted noticeably. After removal from cold storage a ripening temperature of 70° to 75° F. gave the most rapid and uniform ripening and the best product. No effect of soil type on the quality of the canned product was established, providing normal growing conditions prevailed. Measurements of pears growing in the Yakima and Wenatchee Valleys showed an average increase in size of approximately 2 percent per day throughout the season. In case of light dropping of fruits this size increment often offset the loss.

Use of copper-sulphate-treated paper in the cold storage of pears, L. W. TILLER (*New Zeal. Jour. Sci. and Technol., 15 (1934), No. 6, pp. 403-407, figs. 2*).—With alternating layers of sound and *Botrytis* infected pears, very good protection was afforded the sound fruits during 3 mo. of storage at 30° to 32° F. by wrapping all fruits in copper sulfate impregnated paper. The controls wrapped in ordinary paper were approximately all decayed.

The relation of leaf area per cherry to physical properties and chemical composition, E. L. OVERHOLSER and L. L. CLAYPOOL (*Gartenbauwissenschaft, 9 (1934), No. 2, pp. 95-99*).—At the Irrigation Substation, Prosser, Wash., the thinning of Napoleon cherries so as to leave 0, 0.5, 1, 2, 4, and 8 leaves per fruit had little effect on size or quality unless the branches were girdled at the time of thinning. Apparently on the unringed branches the translocation of elaborated nutrients from limb to limb supplied the local shortage. On the ringed branches there was a gradual increment in weight, size, and amount of blush on fruits as the number of the leaves increased. On the ringed branches the fruits with no leaves dropped before ripening. Where there were less than two leaves per cherry on ringed branches fruit bud formation was sharply reduced. Observations on chemical composition showed no consistent effect of leaf adjustments on unringed limbs. On the ringed branches the percentages of total dry matter, ash, reducing, and alcohol insoluble acid hydrolyzable materials tended to increase with the number of leaves. At the same time protein and moisture percentages tended to decrease.

Variation in some economically important characters of small fruits [trans. title], F. GRUBER (*Züchter, 6 (1934), No. 11-12, pp. 294-296*).—Among currants Houghton Castle, Fay New Red, White Versailles, Red Versailles, and Long Clustered White had outstandingly large fruits. A series of sieves used for determining currant size was not always practical in the case of gooseberries because of the oval form of the berries in certain varieties. Second- and third-generation crosses between European and American gooseberries contained a large proportion of small-fruited kinds, suggesting the need of backcrossing to the European parent to secure size as well as mildew resistance. Berry size was apparently governed by multiple factors. Crosses between the wild strawberry and the everbearing strawberry yielded many large-fruited and productive seedlings. A close correlation was observed in the currant between seed number and

fruit size. In the individual cluster smaller size of the currants at the end of the cluster was in most cases associated with fewer seeds. A small seedless currant, Seedless Red, was found rather worthless on account of high acidity and low vigor. Firmness in strawberries, an important consideration both in shipping and preserving, was found difficult to measure. However, fair success was obtained by determining with a graduated lever and adjustable weights the resistance of berries to a round rod.

Bramble fruits: Raspberries, blackberries, dewberries, I-III (*Illinois Sta. Circ.* 427 (1935), pp. 72, pl. 1, figs. 32).—This paper is presented in three parts. In part 1, Bramble Culture (pp. 5-44), A. S. Colby presents general information with reference to varieties, culture, propagation, pruning, mulching, harvesting, etc. Part 2, Bramble Diseases and Their Control (pp. 44-64), by H. W. Anderson, discusses the nature of various diseases and the best known methods of their suppression. In part 3, Bramble Insects and Their Control (pp. 65-72), by W. P. Flint, comparable information with reference to insects is given.

Classification of the species of red currant on a genetical basis [trans. title], N. M. PAVLOVA (*Trudy Prikl. Bot., Genet., i Selekt. (Bul. Appl. Bot., Genet., and Plant Breeding)*, 8. ser., No. 2 (1934), pp. 87-119, figs. 12; *Eng. abs.*, pp. 117-119).—Based primarily on the characters of the leaf rather than the fruits, the author following 7 yr. of study of about 50 varieties presents a classification of currants which is said to add two more groups than were proposed by Berger (*E. S. R.*, 53, p. 424). The shape of the bracts is considered especially valuable for distinguishing descendants of the original parental species.

Cross pollinating the cranberry, H. F. BAIN (*Wis. State Cranberry Growers' Assoc. [Proc.]*, 47 (1933), pp. 7-11).—Following the observation that the McFarlin cranberry is rarely infected sufficiently with false blossom disease to interfere with production, numerous crosses were made using McFarlin as ovule and pollen parent. Good sets of berries and of seed were obtained in most instances. Howes did not prove a good ovule parent with either McFarlin or Early Black pollen. Selfing of McFarlin and Early Black resulted in decreased berries and seed. The technic of pollination and of handling of young seedlings is discussed.

Two years' results of fertilizer work on cranberries, F. L. MUSBACH (*Wis. State Cranberry Growers' Assoc. [Proc.]*, 46 (1932), pp. 29-34).—Fertilizers applied in June 1931 to Wisconsin cranberry soils had no apparent effects on yields of that season. There appeared to be a higher percentage of decay on the fertilized than on the control plats. In 1932 in two of the experimental bogs fertilizers had no apparent beneficial effect, but in a third bog located in northern Wisconsin there was recorded a rather consistent response to complete fertilizers.

Grape varieties with defective flowers [trans. title], M. KONDAREV (KONDAREFF) (*God. Sofiisk. Univ., Agron. Lesov. Fakult. (Ann. Univ. Sofia, Facult. Agron. et Sylvic.)*, 12 (1933-34), pp. 589-615; *Fr. abs.*, pp. 613-615).—None of several treatments designed to influence the nutrition, namely, pruning, girdling, and blossom bud thinning to the extent of removing 50 percent of the buds, appeared to increase the viability of the pollen of grapes possessing short reflexed stamens; in fact, these varieties did not produce any well developed berries with normal-appearing seeds without the benefit of cross-pollination, irrespective of nutritional treatments. Only one variety (*Sinia Bodliva*) produced completely sterile pollen. In the male variety (*Pamid Coulard*) the ovaries were defective and the pollen very good. Pollination of

varieties with normal flowers with pollen taken from varieties with short stamens resulted in no fruit, whereas the same varieties crossed with Pamid Coulard pollen yielded fine clusters with excellent berries.

The viability of grape pollen [trans. title], E. WANNER (*Kühn Arch.*, 37 (1934), pp. 317-365, figs. 4).—A statistical analysis of observations on 10 replicated lots of 1,000 pollen grains each leads to the suggestion that at least 700 to 800 grains per test were required to give an accurate interpretation of results because of the wide variation in the individual trials. The so-called female varieties yielded inferior pollen, but it was impossible to group the remaining varieties due to marked varietal fluctuations. The understocks had no apparent effect on the viability of the pollen produced by the scion, nor did any of the usual commercial manurial treatments exert any material effect on the pollen. There was some indication that phosphorus shortage had an unfavorable effect on pollen germination. No connection could be established between pollen viability and tube length on the one hand and fruitfulness on the other. Grape pollen quickly lost its viability, even when kept under dry conditions.

Maturity standards for the Chaouch and Dattier de Beyrouth grapes [trans. title], N. NEDËLCHEV (NEDELTCHEFF) and M. KONDAREV (KONDAREFF) (*God. Sofijsk. Univ., Agron. Lesov. Fakult. (Ann. Univ. Sofia, Facult. Agron. et Sylvic.)*, 12 (1933-34), pp. 487-504; *Fr. abs.*, pp. 503, 504).—The sugar-acid ratios and standards of length and width are given for the berries of the two varieties.

Muscadine grapes: Culture, varieties, and some properties of juices, W. D. ARMSTRONG, T. A. PICKETT, and M. M. MURPHY, JR. (*Georgia Sta. Bul.* 185 (1934), pp. 30, figs. 10).—In addition to a general discussion of culture, pruning, varieties, fruiting habits, etc., the authors present the results of chemical analyses of the juice of 18 named varieties and 25 numbered seedlings. In the 43 lots total solids ranged from 12.82 to 21.32 percent, pH from 3.42 to 2.96, titratable acidity from 54 cc to 174 cc of $N/10$ NaOH to neutralize 100 cc of juice, and tannin from 0.02 g to 0.417 g per liter. Sucrose was found in the highest percentage (7.4) in Dulcet, and it was altogether absent from Flowers and Memory. Certain varieties, including Hunt, jelled satisfactorily, and others, including Thomas, did not. A table is presented showing the estimated cost and returns from an acre of muscadine grapes over a period of 10 yr.

Varieties of the olive [trans. title], A. BOBONE (*An. Inst. Super. Agron. [Lisboa]*, 6 (1934), No. 1, pp. 45-115, figs. 19).—With data subjected to statistical analyses, information is presented on the trees, foliage, and fruit of a large number of olive varieties growing in Portugal.

Avocado production in Florida, H. S. WOLFE, L. R. TOY, and A. L. STAHL (*Florida Sta. Bul.* 272 (1934), pp. 96, figs. 31).—This is a general discussion in which is presented information on the early history and botany, varieties, pollination requirements, cultural requirements, handling the crop, and the control of disease and insect enemies.

Avocado fractional embryo graftage, H. P. TRAUB and E. C. AUCHTER (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 129, 130).—Again discussing the technic of a new propagation method (*E. S. R.*, 72, p. 483), the authors report that during the winter months the percentages of success ranged from 75 to 95. Among avocados used as scions were Lula, Taylor, McDonald, Winslowson, Waldin, Trapp, and Puebla. Seeds of Guatemalan and West Indian races or their hybrids gave the best results as stocks.

How to overcome the alternate bearing of avocados, R. W. HODGSON (*Calif. Avocado Assoc. Yearbook*, 1934, pp. 92-98).—Based on 6 years' indi-

vidual tree records in a block of 150 bearing Fuerte trees, the author suggests that the avocado is normally alternate bearing and discusses various practices, such as nitrogen fertilization, blossom thinning in the on year, girdling, fruit thinning, etc., that might keep avocados in an annual productive condition. The experimental work had not advanced sufficiently to draw definite conclusions.

On the viability of cacao seeds after storage, E. E. PYKE, E. R. LEONARD, and C. W. WARDLAW (*Trop. Agr. [Trinidad]*, 11 (1934), No. 12, pp. 303-307, fig. 1).—Observations on cacao pods stored at 50°, 60°, 70°, and 80° F. for 10, 20, 30, 40, and 50 days showed the greater loss in weight at the higher temperatures. After 20 days at 80°, when the pods had lost nearly half their weight, the seeds were still reasonably viable. Treatments with various antiseptics, such as mercuric chloride, formalin, and carbolated vaseline, did not reduce materially the losses from latent or incipient infections but did in certain treatments prolong the life of the seed and reduce water losses. Temperatures below 60° even for short periods were harmful.

Influence of fertilizers and soil amendments on citrus trees, fruit production, and quality of fruit, J. J. SKINNER, G. M. BAHRT, and A. E. HUGHES (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 9-17).—A comparison in a seedling orange orchard located on Norfolk fine sand at Orlando, Fla., of ordinary fertilizer mixtures of base-forming properties with equivalent amounts of concentrated materials, such as ammonium phosphate, urea, and potassium sulfate, possessing acid-promoting properties, showed distinctly in favor of the ordinary mixture. Not only were the yields larger, but the fruits were juicier and firmer.

In an experiment conducted near Lake Alfred in cooperation with the Florida Experiment Station eight concentrated fertilizers, seven acid- and one base-forming, were tested on Valencia oranges. The yields from the seven acid-forming fertilizers were similar, but the single base-forming treatment gave as an average over a 5-yr. period 23 percent larger yields than the highest of the acid-forming fertilizers. Observations showed the fruits of the base-forming fertilized trees to be juicier and firmer. Other experiments begun in 1931 at three Florida locations gave further evidence that the reaction of the fertilizer must be considered.

Manganese sulfate applied to tangerines, oranges, and grapefruits located on different soils and in orchards in different conditions of vigor tended to decrease the percentage of juice, to increase the percentage of manganese, the firmness, size or weight, and the intensity of color of the fruit, and to improve the trees with respect to chlorosis. In one test on neutral soil there was less manganese in the fruits of the manganese-treated trees. Used in conjunction with commercial fertilizers, manganese sulfate increased yields on most of the soils.

Progress report of soil fertility and fertilizer experiments on bronzing of citrus, G. M. BAHRT (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 18-20).—In cooperation with the Florida Experiment Station the U. S. Department of Agriculture applied various fertilizer and soil amendments to soils of citrus orchards affected with bronzing, a condition manifested in advanced stages by dead wood, falling leaves, reduced growth, decreased yields, and a change of leaf color from green to deep yellow. In general the trees supplied with magnesium sulfate, calcium sulfate, nitrogen, ground limestone, dolomitic limestone, or ground limestone plus manganese sulfate in addition to the usual fertilizer showed the greatest improvement. There was found to be a greater content of

calcium oxide and also of organic matter in the surface soil beneath normal than beneath bronzed trees. In certain orchards poor drainage contributed to bronzing.

Zinc sulphate as a soil amendment in citrus groves, A. F. CAMP (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 33-39).—Although a large number of experiments conducted by the Florida Experiment Station showed zinc sulfate to be effective in controlling mottle leaf or freckling of citrus, there were instances of no benefit and even of injury. As a result the author warns against the promiscuous use of zinc sulfate and adds that the conflicting results may have been due to the existence of different types of freckling. He points out that there are several grades of zinc sulfate, containing different percentages of water of crystallization, and that these variations should be taken into account by growers.

The origin of a superior red-fleshed grapefruit, W. H. FRIEND (*Jour. Heredity*, 25 (1934), No. 9, p. 358).—A brief account is presented of the discovery in the Rio Grande Valley of a mutant form of Thompson grapefruit bearing fruits with a distinct blushed exterior and with a reddish flesh. The new variety was named Ruby, and the discoverer has been granted a plant patent by the U. S. Patent Office.

Satsuma orange maturity and quality, H. P. TRAUB (*Gartenbauwissenschaft*, 8 (1934), No. 3, pp. 385-393, figs. 5).—In cooperation with the Florida Experiment Station the U. S. Department of Agriculture found, on the basis of one season's work with the Owari and Kawano Wase oranges, that the fruits tended to become more oblate with increasing age. At the same time the specific gravity decreased and was correlated negatively with the percentage of rind and positively with the percentage of rag and juice. The percentage of sugars was correlated positively with the total solids of the juice. Total acids and effective acidity of the juice declined with age, but insipid flavor was not developed until December in the case of the Owari orange growing at Gainesville.

Tangelo varieties and their possibilities, T. R. ROBINSON (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 110-112).—Descriptions are presented of four new hybrid citrus fruits, namely, Lake, Minneola, Seminole, and Umatilla tangelos, all developed at the U. S. Department of Agriculture station at Eustis, Fla.

Glucosides and minerals in citrus fruits, L. W. GADDUM (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 83-85).—The Florida Experiment Station found that the citrus glucosides are compounds of two different sugars (glucose and rhamnose) with a complex organic nucleus (hesperidin and naringenin). Despite the bitterness of naringin, the dried refuse from the grapefruit cannery was eaten readily by cattle. Among minerals revealed by the spectrographic examination of citrus fruits were zinc, copper, manganese, boron, cadmium, aluminum, and lead in addition to the obvious calcium, magnesium, iron, etc. In a number of cases plants suffering from zinc deficiency also showed this lack in their ash. The different elements were found to occur in varying amounts in different portions of the fruit, and in some cases apparently depended on the culture given the orchard.

A device for measuring the ability of citrus fruits to withstand pressure, A. E. HUGHES (*Fla. State Hort. Soc. Proc.*, 47 (1934), pp. 27-30, figs. 2).—A description is presented of an instrument devised by the U. S. Department of Agriculture to measure the pressure exerted by a flexible spring band 0.32 in. in width placed midway between the blossom and stem ends of citrus fruits. Records taken on oranges, tangerines, and grapefruits from trees treated with

manganese sulfate showed the instrument to be effective in recording differences in firmness, in this case consistently in favor of the manganese treatments.

Citrus wastage investigations carried out at Zebediela, Transvaal, during the seasons 1931 and 1932, V. A. PUTTERILL and R. DAVIES (*Union So. Africa Dept. Agr. Bul.* 128 (1934), pp. 49).—Among observations were that navel orange losses due to green mold (*Penicillium digitatum*) decreased as the season advanced, that fruits packed the same day as picked kept better than when wilted for 10 days, and that washing fruit in a 3 percent solution of sodium bicarbonate before packing reduced mold losses. Thymol solution and ammonium bicarbonate washes injured the oranges.

Experimental error in field experiments with pineapples, O. C. MAGISTAD and C. A. FARDEN (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 8, pp. 631-644, figs. 2).—Based on investigations conducted at three different localities on the island of Oahu, T. H., the authors report that native soil heterogeneity was such as to require 8 replications of plats 1 bed wide and 75 ft. long to measure a 5 percent yield difference. It is suggested that plats 3 beds wide with the outer 2 beds discarded from computation would be desirable. Increasing the width of 75-ft. plats from 1 bed to 6 beds resulted in a decrease in standard deviation of only 1.58 percent. Increasing the length of 1-bed-wide plats from 75 to 300 ft. decreased standard deviation only 1.43 percent.

Pollination of the hazelnut [trans. title], E. JOHANSSON (*Sveriges Pomol. För. Årsskr.*, 35 (1934), No. 4, pp. 262-274; *Eng. abs.*, p. 273).—Studies with a considerable number of varieties assembled at Alnarp, Sweden, showed that most of the filberts are self-sterile but that in general cross-pollination gives good results. In those varieties in which the pollen was tested for viability it was generally good. Great confusion was observed in the nomenclature of varieties. There was considerable evidence of intersterility in certain varietal combinations.

[Ornamental horticulture studies by the Cornell Station] ([*New York Cornell Sta. Rpt.* 1934, pp. 94-96).—Among studies briefly discussed are the effect of soil reaction on the color of hydrangeas, forcing and propagation of the hydrangea, and production of cyclamen seed, all by R. C. Allen; photoperiodism studies with various flowers, and methods of growing carnations, both by K. Post; *Tradescantia* as a test crop for soil fertility, by A. M. S. Pridham; growth experiments with pin oaks, and electricity as a source of heat for plant beds, both by D. Wyman.

Application of probable error concept in floriculture, A. M. S. PRIDHAM (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 594, 595, fig. 1).—Studies at Cornell University of the variability in gladiolus, chrysanthemum, and other flowers indicated the practicability of applying the probable error concept to floricultural investigation.

Moisture in relation to the rooting of cuttings, S. W. DECKER (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 596, 597).—Studies at the Illinois Experiment Station with carnations, coleuses, chrysanthemums, and other floricultural species indicated that a lack of moisture in the propagating medium (sand) reduced materially the percentage of rooting.

Influence of media and maturity of wood on the vegetative propagation of *Camellia japonica*, F. S. BATSON (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 598-601).—Comparing river sand, a mixture of sand and German peat, and German peat as media for rooting cuttings taken in August, December, and February, it was found at the Mississippi Experiment Station that the sand and the sand-peat mixture were superior to the peat alone. Seasonal differences in

rooting were small and inconsistent. In all cases shoots which produced a large number of roots also produced a greater total length of roots.

Forcing gladiolus, W. E. LOOMIS (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 585-588).—Studies at the Iowa Experiment Station indicated that storage and soil temperatures of 25°-40° C. (77°-104° F.) are successful for forcing the germination of gladiolus corms. Acceleration varied from 2 weeks for moderate treatments late in the season to 4 mo. for recently-dug corms. Ethylene treatments after moderate, high-temperature exposure were effective with Halley and certain others but not with Alice Tiplady. Chemical treatments which did not increase the sucrose content of corms did not stimulate flowering. Although Arlon and Tiplady corms blossomed in January and February at Ames with normal daylight, Halley would not blossom before April 1 without supplemental light.

Preliminary report on breeding rust resistant snapdragons, H. E. WHITE (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 589, 590).—Starting with rust-resistant strains of undesirable flower characters, crosses were made at the Massachusetts Experiment Station of one such strain with 10 different commercial varieties. Observations on the resulting F₁, F₂, and F₃ seedlings indicated that inheritance of rust resistance is apparently controlled by a dominant factor, and that resistance tends to stay with white and yellow colors, suggesting linkage. Complete susceptibility was obtained in crosses between different commercial varieties. Selected resistant strains withstood direct inoculation.

Pollen analysis for rose-breeders, E. W. ERLANSON (*Amer. Rose Ann.*, 1934, pp. 63-68, figs. 6).—During the examination of the pollen of native American roses there was observed an average of about 20 percent of empty grains in all species except *Rosa acicularis* and *R. palustris*, which showed only 10 percent of poor pollen. The author discusses the probable causes of sterility in the rose and indicates how determinations may be made microscopically. The relation of chromosome numbers to fertility and sterility is discussed.

Effects of prolonged storage on forcing qualities of summer-budded roses, F. F. WEINARD and S. W. DECKER (*Illinois Sta. Bul.* 409 (1934), pp. 10).—Lots of Matchless, Pernet, Rapture, and Rose Hill rose plants budded by a commercial firm in summer and dug and stored before the buds had started into growth were received by the station on March 18, April 15, May 15, and June 15. The number of plants lost in starting was progressively greater with the lengthening of the storage period, being 17, 20, 23, and 28 percent, respectively. In many plants shoot growth was notably stronger than root growth, particularly in the later lots, indicating that prolonged storage was more injurious to roots than buds. Paraffining had little or no effect in preventing losses in late-planted stock. Of the four roses, Pernet suffered the greatest losses. In general, the results suggested that normal yields may be expected from plants which become established in the greenhouse beds, even though started relatively late.

Some effects of storage on flowers in various gases at low temperatures on their keeping qualities, L. E. LONGLEY (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 607-609).—At 33° to 34° F. and in an atmosphere containing 8 and 10 percent CO₂ rose and carnation flowers did not keep appreciably better than the controls. In the Briarcliff rose the CO₂ retarded the opening of the buds and enhanced the color slightly. The flowers were somewhat softer in the CO₂ lots. A concentration of 25 percent CO₂ did not give good results. SO₂ in 1 part per 2,000,000 of air improved the keeping of carnations, and promising results were secured also with H₂S. Roses with stems in 10 percent sugar

solution and in an atmosphere of 10 percent CO₂ were slower in opening, but the petals were deformed. With the same treatment carnations did not keep as well as in water.

Propagation of evergreens under different temperatures at different times of the year, G. B. DURHAM (*Amer. Soc. Hort. Sci. Proc.*, 30 (1933), pp. 602-606).—Bottom heat supplied by lead-insulated cables was found at the Rhode Island State College to be beneficial in the rooting of many different evergreens, including *Thuja*, *Juniperus*, *Taxus*, *Euonymus*, *Ilex*, *Rhododendron*, *Kalmia*, and *Azalea*. There was observed a positive correlation between the amount of starch present in the cuttings and the rate of callusing and also of rooting. The type of cut had no apparent effect on the percentage of rooting. Overhead heat was of no benefit in rooting.

Growth experiments with shade trees, D. WYMAN (*Natl. Shade Tree Conf. Proc.*, 9 (1933), pp. 37-41).—Observations on pin oaks carefully graded for uniformity in size and planted loosely, roughly, and with care showed that the manner of planting is important in spring but has little significance in autumn, apparently because of physical changes in the soil during winter. Losses in fall-planted and spring-planted trees were 16.5 and 9.5 percent, respectively. The pruning of lower branches from newly-set trees tended to reduce new growth sharply. Fertilizers applied in crowbar holes at the time of planting had no effect on growth or foliage color the first season, apparently because of the distance from the feeding roots. The second season nitrogen fertilizers had a decided stimulating effect. None of the fertilized trees showed chlorosis exhibited by several of the controls.

Recent developments in the Cornell shade tree experiments, D. WYMAN (*Natl. Shade Tree Conf. Proc.*, 10 (1934), pp. 111-114).—Further records taken on pin oaks growing at Cornell University showed that the removal of the lower limbs at the time of planting reduced growth the second season after planting. Trees which received fertilizer in 1932 and none in 1933 made decidedly more growth than comparable trees which were never fertilized. As little as 0.5 lb. of ammonium sulfate per tree applied in holes in the soil about the base of the young trees caused injury unless the application was divided into installments.

FORESTRY

[Forestry studies by the Arkansas Station] (*Arkansas Sta. Bul.* 312 (1934), pp. 47, 48).—Data are reported on the following projects by L. M. Turner: Water and mineral requirements of seedlings of *Pinus echinata* and *P. taeda*; planting experiments with black locust, catalpa, Osage-orange, black walnut, sweetgum, tulip poplar, paradise tree, and western yellow and Scotch pines; root studies with *P. echinata* and *P. taeda*; and land utilization studies with respect to value for forestry purposes.

[Forestry at the Iowa Station] (*Iowa Sta. Rpt.* 1934, pp. 72, 153).—Brief reports are presented on the following projects: The treatment of black locust seed to increase germination, by R. H. Porter, E. O. Brown, C. M. King, and G. B. MacDonald, and tests of Douglas fir for planting under different soil, moisture, and climatic conditions, by MacDonald.

[Forestry studies by the Cornell Station], J. M. SPAETH ([*New York Cornell Sta. Rpt.* 1934, pp. 97, 98).—The following projects are discussed: Improved practices in the production of forest planting stock; establishment, culture, and development of forest plantations; and methods of killing trees to prevent production of root suckers and sprouts.

[Forestry at the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 308 (1934), pp. 18, 19).—A brief review is presented of studies of repellents for treating forest seeds to prevent their consumption by squirrels, chipmunks, and mice, by A. C. McIntyre and V. R. Haber; the variation in the composition of sap from individual maple trees, by McIntyre and H. O. Triebold; and of the effects of severe drought on the tree composition of Pennsylvania forests, by J. A. Ferguson and McIntyre.

The original forest types of southern New England, S. W. BROMLEY (*Ecol. Monog.*, 5 (1935), No. 1, pp. 61–89, figs. 8).—Based on writings of the early colonists and on a study of geographic and environmental features, the author attempts to reconstruct the original forest flora of southern New England. Annual burning by the Indians tended to restrict the species, except in the swamps, to fire-resistant forms such as the oaks. On the basis of physiographic factors the author divides southern New England into three major forest regions, namely, oak, white pine, and northern forest. Heavy pasturing, chestnut extermination, and drastic cutting of white pine have been factors in changing the forest flora.

Forest-type studies in the Adirondack region, C. C. HEIMBURGER ([*New York*] *Cornell Sta. Mem.* 165 (1934), pp. 122, figs. 14).—In attempting to classify the forest lands of the Adirondack region on the basis of ground vegetation, the relation of forest type to site quality and site-determining factors was studied by field observations on topography, geology, drainage, soil profile, and humus layers and by laboratory tests on soil texture, content of available lime, acidity, and nitrification. It was observed that differences in drainage conditions and in the geological origin of the soil are of primary importance in the distribution of the flora. Based on differences in the flora, the soils, and the forests, the Adirondack area is subdivided into three major floristic provinces—the subalpine, comprising the upper forested slopes; the western, occupying the major part of the region; and the eastern, represented by the valleys of the extreme eastern section. For each of the three areas a set of forest types was established and is discussed in detail. Three, 9, and 10 subtypes are designated for the subalpine, western, and eastern provinces, respectively.

The silvicultural adaptations of the several regions are discussed and show in general that the western province is for the most part well adapted to the growing of red spruce and other economically valuable softwoods, the eastern province to white pine, and the central more mountainous area to a mixed forest. The occurrence of mull in the Adirondack area is said to indicate usually a site too rich for red spruce. Supplemental data, precipitation, temperature, species composition, and various types and subtypes are appended.

The relation between tree size and mortality caused by fire in southern Appalachian hardwoods, E. F. MCCARTHY and I. H. SIMS (*Jour. Forestry*, 33 (1935), No. 2, pp. 155–157, fig. 1).—Stating that forest fires in the southern Appalachian region usually destroy a larger proportion of the younger than the older trees, curves are presented showing the relation between size of trees and mortality for fires of 10 degrees of severity. In view of the variability and intensity of forest fires in hardwood stands of this area, the need of evaluating intensity is stressed, and a method of rating is suggested by the authors.

Rainfall and hemlock growth in New Hampshire, C. J. LYON (*Jour. Forestry*, 33 (1935), No. 2, pp. 162–168, figs. 3).—Microscopic examination of the rings of cross sections of two hemlock trees secured from a cutting of virgin timber near Wakefield, N. H., showed that for nearly three centuries

there had been a marked correlation in growth rates in the two trees. An examination of rainfall records from a nearby station dating back to 1857 revealed a close relationship between growth increment and growing season rainfall. This was particularly manifested in drought or notably wet years. That temperature was not a highly important influence was shown in the fact that the historically cold summer of 1816 did not affect noticeably annular increment.

Effect of flower production on rate of growth of vegetative shoots of longleaf pine, L. J. PESSIN (*Science*, 80 (1934), No. 2077, pp. 363, 364).—An examination of the terminal growth of longleaf pines of about 25 yr. of age showed that the shoots bearing staminate strobili were relatively short as compared with those bearing pistillate strobili or none. Measurements of labeled shoots in the 1931 season showed the pistillate to make approximately twice the growth of either the vegetative or staminate shoots, and to suffer no mortality from insect attack as compared with 6 and 31 percent, respectively, for the other two groups. The possibility that the production of pistillate strobili stimulates shoot development is conjectured.

Release of young Norway pine from aspen competition (*Jour. Forestry*, 33 (1935), No. 2, pp. 174, 175).—Release cuttings made in 1931 in a Norway pine plantation established in 1915 on the Superior National Forest (Minnesota), and which had become weedy with aspen and brush, resulted in greatly increased diameter growth. On the completely released plat the Norway pine made nearly 2.5 times the growth of the control trees. With partial release the gain was 1.5 times the control. Height growth was benefited to a lesser extent.

Cape Cod pitch pine: Its resistance to gipsy moth defoliation and its advantages as a forest tree, R. C. HALL (*Jour. Forestry*, 33 (1935), No. 2, pp. 169–172, fig. 1).—Results of a study of the comparative growth of pitch pine and associated species on Cape Cod areas severally attacked by gipsy moths indicated that the pitch pine is more resistant to injury than any other native species. Since the tree is also resistant to fire and salt spray damage and is long lived, it is considered valuable for planting in the region.

Koa reproduction after fire, C. S. JUDD (*Jour. Forestry*, 33 (1935), No. 2, p. 176).—Three mo. after a fire had swept over an area in Hawaii koa seedlings were found ranging in height from 4 to 11 in. Especially in the vicinity of old trees, wherever the mineral soil was exposed by the fire the koa seedlings were very abundant.

A movable, constant-orientation, lookout mapboard, L. H. REINEKE (*Jour. Forestry*, 33 (1935), No. 2, pp. 133–136, figs. 2).—An effective method of mounting mapboards is discussed which employs a system of three or more, but preferably four, metal links or double-end cranks, one end of each pivoting at the corners of a rectangle laid out on a stationary table top or pedestal and the other ends pivoting at the corners of an identical rectangle laid out on the under side of the mapboard.

DISEASES OF PLANTS

[Plant disease studies in Arkansas] (*Arkansas Sta. Bul.* 312 (1934), pp. 48–54).—The results are summarized of studies on resistance to wilt (*Fusarium vasinfectum*) in cotton varieties, its nature, and the influence upon it and upon “rust” (potash hunger) of various fertilizers, by V. H. Young and J. O. Ware; on the etiology and control of “sore shin” and other types of damping-off of cotton seedlings, including cotyledonary attack by *Bacterium malvacearum*,

through the use of seed treatments, by Young; on fire blight of apples and pears and the use of bordeaux mixture for its prevention, on the relative effects of leaf hoppers and bordeaux sprays in tip and margin burning of potato leaves, and on the *Sclerotium* rot of cantaloups, potatoes, and other plants, all by H. R. Rosen; on seedling blights of rice (*Fusarium*, *Rhizoctonia*, *Helminthosporium*, *Pythium*, and *Sclerotium*) and their reduction by seed treatment and on rice smut (*Tilletia horrida*), both by E. M. Cralley; stem rot of rice (*Leptosphaeria salvinii*), a closely related rice fungus (*H. sigmoideum irregulare*), and the sclerotial disease of rice (*S. hydrophilum*), by Cralley and E. C. Tullis; the effects of rice straw and irrigation methods on the straighthead of rice, by Cralley, L. C. Kapp, and Tullis; and on timber rotting fungi of Arkansas, by D. Swartz.

[**Plant disease studies in Colorado**] (*Colorado Sta. Rpt. 1934*, pp. 9, 11).—Brief reports are included of work on the control of bacterial wilt and winter-killing in alfalfa; testing peppers and related plants for resistance to *Phytophthora capsici* wilt; field spraying for the control of purple blotch of onions; cultural control of crown rot and damping-off of pyrethrum caused by *Phytophthora* sp. and *Pythium* sp., respectively; Canada thistle wilt (*Sclerotinia sclerotiorum*); control of a *Sclerotinia* on Chinese elm seedlings by sanitation; and on mosaic of peaches in the Palisade district.

[**Plant disease studies at the Georgia Coastal Plain Station**] (*Georgia Coastal Plain Sta. Bul. 24 (1934)*, pp. 99–106, figs. 3).—Brief reports are given of the results of studies on the varietal susceptibility of tobacco to root knot and downy mildew, the relation of cultivation practices and crop-rotation tests to tobacco root knot, and tests on tobacco mildew (blue mold) control by sulfur and copper sprays and by maintaining high temperatures.

[**Plant disease studies in Iowa**] (*Iowa Sta. Rpt. 1934*, pp. 64–73, 74–76, 78, 79, 153, 154, fig. 1).—Brief reports are given on the following investigations: Biology of *Bacterium insidiosum* in its relation to alfalfa wilt, by C. S. Reddy (p. 64); inheritance of resistance to *Basisporium* ear rot and seed rotting, and the relation of these characters to pH, by Reddy and E. W. Lindstrom (p. 64); development of a watermelon resistant to anthracnose (*Colletotrichum lagenarium*), as well as to wilt, by D. V. Layton (p. 65); breeding and selection of strains of watermelons more resistant to *Fusarium niveum* wilt, by J. J. Wilson (pp. 65, 66); physiological specialization and parasitism of crown rust of oats (*Puccinia coronata avenae*) (pp. 66, 67), and production of new strains of oats resistant to crown rust by selection and hybridization (p. 67), both by Murphy; control of seed- and soil-borne diseases, including virus diseases of the potato, by Reddy (pp. 67, 68); the spread and effects of leaf spot (*Cercospora beticola*) of sugar beets, by W. J. Henderson (p. 68); effects of environment on the persistence of *C. beticola* in the soil, by S. M. Dietz (pp. 68, 69); acid soils in relation to seedling diseases of sugar beet caused by species of *Phoma*, *Rhizoctonia*, *Pythium*, etc., by Reddy (p. 69); breeding and selection of Iacope (an early cabbage) for resistance to cabbage yellows [*F. conglutinans*], by Wilson (p. 69); development and testing of dust fungicides for control of seed-borne smuts of oats, by Reddy (pp. 69, 70); treatment of sweetpotato seed stock to reduce stem rot, by Wilson (p. 70); variations in pathogenicity of cedar apple rust (*Gymnosporangium juniperi-virginianae*) in Iowa (p. 70), and control of *Bacterium pruni* canker of cherry nursery stock, control of apple scab (*Venturia inaequalis*), and comparison of bordeaux mixture and lime-sulfur for cherry leaf spot control (pp. 70, 71), both by G. L. McNew; effect of increased CO₂ on spore germination in *Aspergillus flavus*, *Penicillium humicola*, and *Spicaria divaricata*, by J. C. Gilman

(p. 71); barley seed infections and seed treatment of barley and wheat, by R. H. Porter, E. O. Brown, and C. M. King (pp. 71, 72); morphology and cytology of wilt-resistant strains and varieties of melons, by L. M. Weetman (p. 73); control of onion seedling blight and bulb rot, by I. E. Melhus and Henderson (p. 74); factors influencing nodal infection of corn by *Ustilago zeae*, by Melhus and G. N. Davis (pp. 74, 75); relation of soil moisture to soil infection of corn by *Diplodia zeae* and prevention of seedling blight by seed treatment with extract from *D. zeae*, by Melhus (p. 75); physiological response of the growing plant to chemical treatments of seed corn (p. 75), and pathogenicity of *Basisporium gallarum* to corn (pp. 75, 76), both by Reddy; mercurial treatment of flaxseed, by Reddy and L. C. Burnett (p. 76); a mosaic-like disease of the American elm, *Cytospora* and *Dothichiza* cankers of *Populus*, ash canker, and mycological survey of the tree diseases of Iowa, by Reddy, McNew, Davis, Melhus, and G. C. Decker (pp. 78, 79); and control of white pine blister rust in Iowa, by G. B. MacDonald, C. J. Drake, and Melhus (pp. 153, 154).

[Plant disease studies in Nebraska] (*Nebraska Sta. Rpt.* [1933], pp. 14, 15, 24-27).—Brief reports are included on investigations of spray materials for apple scab and apple black rot control; environmental conditions influencing the development of stem rust of wheat in the absence of an alternate host; the testing of alfalfa varieties and strains for wilt resistance and resistance to freezing damage; potato scab and *Fusarium* wilt of potato in relation to infection from the soil and the factors which influence it; spraying for the control of cherry leaf spot disease (*Coccomyces hiemalis*); and bacterial halo blight and bacterial wilt of garden beans in Nebraska.

[Plant disease studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt.* 1934, pp. 101-111).—Brief reports are given on the results of studies on the following subjects: Factors affecting the efficiency of potato spraying, by F. M. Blodgett, E. O. Mader, R. B. McCormack, O. D. Burke, et al.; control of scab, *Rhizoctonia*, and pitting of potatoes, and resistance of potato varieties to scab (*Actinomyces*), by Blodgett, C. F. Taylor, and E. K. Cowan; the natural transmission of virus diseases of the potato, by K. H. Fernow; potato yellow dwarf, by L. M. Black; fire blight and winter injury, and spraying with bordeaux mixture for the control of fire blight of apple, pear, and quince in the bloom, both by E. M. Hildebrand; a study of lime-sulfur and substitute fungicides for the control of apple scab in western New York, by W. D. Mills, Hildebrand, and A. B. Burrell; effect on set of fruit of spraying fruit trees while in bloom, by Hildebrand et al.; the control of the brown rot disease of stone fruits, and studies on the seasonal development of the pear scab pathogen (*Venturia pyrina*) in relation to weather conditions and the seasonal development of the trees, both by Mills; bacterial leaf spot of carnation (*Phytophthora woodsii*), by C. E. F. Guterman and W. H. Burkholder; mosaic and leaf scorch of narcissus and their control, by F. A. Haasis et al.; cutting rot of geraniums, and bacterial corm rot of cyclamen, both by D. L. Gill; aster rust and its control, by Guterman; *Nectria* canker of basswood and other hardwoods, and foliage and other diseases of poplar, both by D. S. Welch; control of onion smut (*Urocystis cepulae*) with formaldehyde dust, and development of a forcing tomato resistant to *Cladosporium* leaf mold, all by A. G. Newhall; and sanitation and spraying for control of blights on frame-grown celery, by M. B. Linn.

[Plant disease studies in Pennsylvania] (*Pennsylvania Sta. Bul.* 308 (1934), pp. 15, 16).—Brief reports are given on the results of investigations on potato breeding for resistance to degenerative diseases, by E. L. Nixon;

and the control of tobacco wildfire with bordeaux mixture and *Physalis virginiana* as a wild host, and mushroom truffle and its control, both by W. S. Beach.

[**Plant disease studies in South Carolina**] (*South Carolina Sta. Rpt. 1934*, pp. 33-35, 36-38, 39, 41-44, 104, 105, 136, figs. 5).—Brief reports are given on the following studies: Seedling diseases of cotton caused by the anthracnose fungus *Colletotrichum gossypii*, damping-off of cotton by *Pythium ultimum*, and the effect of nematodes (*Aphelenchoides parietinus*) on cotton seedling growth, all by C. H. Arndt; tobacco downy mildew (blue mold) and its control by heat, forced air ventilation, and spraying, by G. M. Armstrong, C. B. Sumner, and W. M. Lunn; and bean seed treatment for damping-off and root rot caused by *Pythium* and *Fusarium*, the influence of fertilizers on root rot, and the control of powdery mildew of beans by sulfur, lime, and colloidal clay, by W. D. Moore.

Phytopathological notes: Contributions on plant diseases due to fungi [trans. title], J. B. MARCHIONATTO (*Rev. Facult. Agron. La Plata*, 3. ser., 19 (1933), No. 3, pp. 407-426, figs. 12).—The author describes and presents photographs showing the symptoms of citrus anthracnose, sycamore anthracnose, *Dothiorella* canker of poplar, *Phoma* canker of peach, *Cytospora* die-back of fruit trees, pepper anthracnose, barley scald, *Heterosporium* of oats, *Botrytis* blight of peony, melanose of citrus, mandarin rot, *Rhizoctonia* disease of sugar beet, *Ascochyta* spot of peas, *Coniothyrium* of rose, *Gibberella* disease of wheat, and *Septoria* on poplar.

Our work on plant diseases, G. O. OCFEMIA (*Philippine Agr.*, 23 (1934), No. 5, pp. 467-475, figs. 2).—The work of the department of plant pathology of the College of Agriculture of the University of the Philippines since its establishment is reviewed, and the results are briefly outlined of investigations on the etiology of coconut bud rot (*Phytophthora palmivora*), on bunchy top of abaca, Fiji disease of sugarcane, and sugarcane mosaic.

Conference on co-ordination of agricultural research and plant protection (*Nairobi: Govt.*, 1934, pp. [5]+56).—This is a report to the Conference of Governors of British East African Territories of a conference held at the Amani (Tanganyika) Research Station, February 12-15, 1934, to consider the coordination of East African research on coffee and on the diseases and pests of coffee and other crops, and also to consider the possibility of developing a coordinated policy relating to plant protection regulations both as applied to plant importations from external sources and to exchange of plant materials between the East African Territories.

In respect to plant protection, the conference approved the outlines for a uniform plant protection ordinance (Appendix VI) and adopted a schedule of plant imports (Appendix VII), listing five classes, namely, (1) total exclusion, except by special permit granted by the directors of agriculture and the director of the East African Research Station, in agreement; (2) permitted to be imported only through a central quarantine at the request of any one of the above officials; (3) permitted to be imported by any one of these officials; (4) permitted to be imported only under permit previously obtained; and (5) permitted to be imported without permit, but subject to inspection, and, if held necessary, treatment and quarantine (local or central). The last class includes all seeds and all fruits and vegetables for consumption not listed under the previous classifications.

Uniformity in rules, forms used, and in instructions to inspectors was urged.

Regarding resistance and acquired immunity in plants [trans. title], R. A. L. LINCKLAEN ARRIËNS (*Landbouwk. Tijdschr. [Amsterdam]*, 46 (1934),

Nos. 562, pp. 514-523; 563, pp. 557-567).—The author discusses recent contributions to the subject.

Virus diseases of plants: A bibliography, D. ATANASOFF (*Sofiya (Sofia): Houdojnik Ptg. Co., 1934, pp. [4]+219*).—The first section lists works on fundamental problems, the second lists works covering more than one virus disease, while the rest of the book gives the literature arranged alphabetically by author under each of 54 families, or their subdivisions, with a final section on insect vectors of viruses, followed by an author index. Probably 4,000 references to literature from the eighteenth century to 1933 are included.

Notes on the rusts of Pennsylvania, H. W. THURSTON, JR., and W. L. WHITE (*Penn. Acad. Sci. Proc., 7 (1933), pp. 140-148*).—Eleven species not previously recorded from this State are listed, and notes are given on others collected for the Pennsylvania Experiment Station.

The microcyclic species of Puccinia on Solanum, F. D. KERN (*Mycologia, 25 (1933), No. 6, pp. 435-441, pl. 1*).—This is a contribution from the Pennsylvania Experiment Station.

Studies on a lethal principle effective in the parasitic action of Trichoderma lignorum on Rhizoctonia solani and other soil fungi, R. WEINDLING (*Phytopathology, 24 (1934), No. 11, pp. 1153-1179, figs. 6*).—In work at the California Citrus Experiment Station, the filtrate from cultures of a pigmented strain of *T. lignorum* isolated from *Citrus* proved lethal to *R. solani*. The lethal principle appeared to be excreted by the young hyphae only. It decomposed rapidly in air, the rate increasing with the pH and being retarded by low temperatures. It was not completely destroyed either by boiling or by anaerobic conditions. The parasitic activity of *Trichoderma* against *Rhizoctonia* was influenced by external factors in much the same way as was the secretion of the lethal principle in culture.

Not all cultures acted alike in respect to the influence of pH on parasitic ability. Good control of damping-off of *Citrus* seedlings due to *R. solani* was secured by adding *Trichoderma* spores to a sufficiently acid, sterilized soil. *T. köningii* and *T. album*, as well as all isolates of *T. lignorum* tested, were found to attack the *Rhizoctonia*. *T. lignorum* was also capable of parasitizing *R. bataticola* and *Armillaria mellea*.

Crosses between sexually bipolar and multipolar species of smuts [trans. title], R. BAUCH (*Ztschr. Induktive Abstam. u. Vererbungslehre, 67 (1934), No. 2, pp. 242-245*).—The results are reported of experiments which included the bipolar *Ustilago grandis*, *U. avenae*, *U. hordei*, *U. bromivora*, and *U. perennans*, and the multipolar species *U. zaeae*, *Sphacelotheca schweinfurthiana*, *S. panicumiliacei*, *U. longissima*, and *U. hypodytes*. Except for the last mentioned, sexual reactions were obtained with all these species. The theoretical implications from a genetic standpoint are discussed.

The standing of two species of Uromyces on Panicum, H. W. THURSTON, JR. (*Mycologia, 25 (1933), No. 6, pp. 442-445, figs. 2*).—This is a contribution from the Pennsylvania Experiment Station.

The influence of various copper-containing fungicides on the transpiration rate, J. D. WILSON and H. A. RUNNELS (*Ohio Sta. Bimo. Bul. 172 (1935), pp. 13-16*).—Continuing studies on the effect of bordeaux mixture on transpiration already reported (*E. S. R., 72, p. 490*), the authors tested 24 copper-containing fungicides in comparison with bordeaux mixture for their effect on transpiration, using the sensitive coleus plant for this purpose. The technic used was the same as in the earlier experiments. Uniform plants in 0.5-gal. tinned cans were placed on a rotating table, their transpiration rate determined for 2 days before treatment, then again for 2 days after a portion of them

had been treated with bordeaux mixture 4-6-50 and other lots with materials to be compared, an unsprayed set of controls being left.

It was found that bordeaux mixture used alone caused the plants to lose slightly over 11 times as much water during the period from 7 p. m. to 7 a. m. as did the untreated plants, and this was greater than that lost by the plants sprayed with any other copper-containing material. The highly insoluble copper compounds caused a smaller increase in transpiration than did bordeaux mixture. The compounds containing copper in the colloidal form caused the smallest increase in transpiration of any of the compounds used, while the greatest increases in transpiration were caused by the sprays in which a soluble copper compound was present to act with hydrated lime.

Zinc oxide as a seed and soil treatment for damping-off, J. G. HORSFALL (*New York State Sta. Bul. 650 (1934), pp. 25, figs. 6*).—The results of experiments with zinc oxide in comparison with a number of other materials in 1932, 1933, and 1934 showed the effectiveness of this material for preventing post-emergence damping-off in seedbeds when applied as a continuous layer to the soil surface at the rate of 0.5 to 1 oz. per square foot prior to emergence. Under some conditions, not well understood, when applied to transplants the foliage of certain kinds of plants showed scorching. The surface application to the soil did not prevent attack previous to emergence and hence must be regarded as a supplement to, not a substitute for, seed treatment. Because the chemical does not penetrate the soil, disease control was unsatisfactory where seed was planted deeper than 0.25 in.

Suggestions on methods of application are given. It is advised that if used on transplants, the zinc oxide be applied dry, avoiding hot or sunny conditions, and brushed from the foliage before rinsing into the soil.

Zinc oxide, when used for seed treatment, was not as generally effective in the station tests as red copper oxide, but proved even more effective for some plants, particularly crucifers and lettuce. On cabbage seed, it compared favorably with Semesan in effectiveness.

Cercospora foot rot of winter cereals, R. SPRAGUE and H. FELLOWS (*U. S. Dept. Agr., Tech. Bul. 428 (1934), pp. 24, pls. 6, figs. 3*).—A foot rot disease of winter wheat and winter barley caused by the fungus *C. herpotrichoides* Fron is important in certain portions of the Columbia Basin in Oregon, Washington, and Idaho. The disease is also known to occur in France.

The bulletin presents the results of cooperative studies on this disease by the Bureau of Plant Industry in cooperation with the Oregon, Washington, and Idaho Experiment Stations extending over a period of more than 10 yr.

"The fungus attacks the base of tillers in early spring, forming elliptical eyespot lesions on the leaf sheaths. It penetrates into inner tissue, forming lesions in the first or second basal internode of the developing culms. Stromata are formed on the lesions, giving them a charred appearance. The lesions later shrivel, and the culms may buckle and fall under the weight of the maturing head, especially in the case of wheat. *C. herpotrichoides* usually does not cause severe stunting of the attacked plants, nor does it attack the roots of such plants, two characteristics that distinguish it from *Ophiobolus graminis*.

"The degree of injury caused each year . . . varies considerably with seasonal climatic conditions, crop practices, and the application of control measures. The loss by this foot rot is due to reduction in the number of culms, decrease in head size and grain weight, and increased difficulty of harvesting the fallen, irregularly ripening grain. *C. herpotrichoides* is mainly confined to fine or very fine sandy loam prairie soils.

"Many varieties of wheat, barley, and rye, and a number of grasses are susceptible to *C. herpotrichoides*, whereas oats are nearly immune under arti-

ficial inoculation conditions. No wild hosts are known." No wheat varieties of commercial importance in this region were found to be resistant to the disease, but certain other varieties appeared to show definite resistance. Spring-sown grain escapes the disease.

"The fungus enters either directly through the cell walls of the host or through stomatal openings. It invades intracellularly and forms external and internal stromata on the host." Histological studies of the disease are discussed.

It is shown that the primary invader in the early spring in the plants infected with foot rot is *C. herpotrichoides*. The conidial stage, which is the only known spore stage, develops on corn meal cultures incubated under favorable conditions of temperature and humidity. It occurs on infected plants in the field in early spring. The sporulating cultures are fully described. The conidia germinate slowly, and after several days produce the smoke-gray colonies characteristic of *C. herpotrichoides*.

Under conditions at Corvallis, Oreg., cereals were severely injured in naturally infested soil in a cool-temperature greenhouse held at 4° to 20° C. Similar results were obtained in localities in eastern Oregon.

The fungus lives over winter on infected stubble. Spores were found to transmit the disease, although their importance, under natural conditions, is not known.

The results of studies on various methods of control indicate that crop rotation, proper choice of varieties, and avoidance of early fall seeding are important aids in combating the disease. Fertilizers and chemicals proved to have little value in controlling the disease in the field.

Experience in regard to infection and injury from the cereal mildew (*Erysiphe graminis*) where winter and summer barley are grown simultaneously [trans. title], H. PAPE and B. RADEMACHER (*Angew. Bot.*, 16 (1934), No. 3, pp. 225-250, figs. 4).—The general situation regarding mildew on barley is discussed, and records are given showing that winter barley provides a serious source for the infection of spring barley grown nearby. Wind plays the important role in the direction of spread. Windbreak hedges hinder the spread of the fungus. Winter barley is subject to infection in the fall from volunteer plants in the summer barley fields, but is not attacked so seriously, as a rule, as the summer barley. *Cercospora herpotrichoides*, the cause of falling foot disease of wheat, was found to multiply well on old winter barley leaves killed by mildew. None of 84 summer barley varieties showed satisfactory mildew resistance, but 2 out of 44 winter varieties proved nearly free from attack, Blätterkinder and *Hordeum hexastichum pyramidatum*.

Studies on the dehulling of barley kernels with sulphuric acid and on the inheritance of reaction to covered smut, *Ustilago hordei* (Pers.) K. & S., infection in crosses between Glabron and Trebi barleys, W. H. JOHNSTON (*Canad. Jour. Res.*, 11 (1934), No. 4, pp. 458-473, figs. 2).—From the results of the author's tests, the use of concentrated sulfuric acid is considered unsatisfactory for dehulling seeds of barley hybrids in order to induce infection by *U. hordei*, as it involved complications which made exact analysis of the reaction of the hybrids impossible.

"Genetic studies were made on the F₂ of reciprocal crosses of Glabron, highly resistant, and Trebi, moderately resistant to the form of pathogen used. Infection percentages exhibited by the parents were regained in some F₂ lines, and the hybrids showed little tendency toward greater susceptibility than the parents. Segregation for reaction to covered smut was not sufficiently clear to establish the inheritance of this character.

"Slight correlation was demonstrated between smut reaction and height of plant, but none between smut reaction and barbing of awns or earliness of heading. The development of strains combining earliness, smooth awns, and resistance to covered smut should present no great difficulty."

Investigations on physiologic specialization of *Tilletia laevis* in Kansas, L. E. MELCHERS (*Phytopathology*, 24 (1934), No. 11, pp. 1203-1226, figs. 2).—The results are reported of 4-yr. tests at the Kansas Experiment Station on the differences in reaction of 12 varieties of winter wheat to collections of bunt (all proving to be *T. laevis*) from various counties in Kansas. Seven physiologic forms of bunt are described, their known distribution in Kansas is mapped, and a dichotomous key for their separation is given. Turkey × Bearded (C. I. 8243) and Yogo (C. I. 8033) showed resistance to all collections tested.

Reinoculating bunt on resistant varieties of wheat that showed small percentages of bunt the previous year resulted in an increased infection in 10 cases out of 32. There was some indication that new bunt forms may have developed by segregation during the tests.

Chlamydospores germinated and colony growth started well on plain agar, soil extract agar, and wheat (grain) extract agar.

Preliminary studies on *Cercospora herpotrichoides* [trans. title]. O. MORITZ and H. BOCKMANN (*Angew. Bot.*, 15 (1933), No. 5, pp. 409-419, figs. 2).—Isolations from foot rot damaged wheat from several regions of Germany disclosed the presence of *C. herpotrichoides*. Culture studies indicated that sporulation of this fungus is favored by low temperatures and is greatly affected by the nutrient medium employed. Aerial mycelium was generally absent, but spores were present in great quantities on soil agar provided the temperature variations reached below 0° C.

Inheritance of resistance to powdery mildew, *Erysiphe graminis tritici*, in wheat, E. B. MAINS (*Phytopathology*, 24 (1934), No. 11, pp. 1257-1261).—The resistance of Norka (C. I. 4377) in the seedling stage to physiologic form 1 of *E. graminis tritici* was found to be inherited like that of Red Fern as a simple dominant factor. The resistance of Hope (C. I. 8178) in the seedling stage was found to be inherited as a simple recessive factor, as in Sonora (C. I. 4293) and apparently also in Michigan Amber 29-1-1-1 under conditions favorable for its maximum expression. The resistance of Norka to p. f. 1 of mildew and to p. f. 3 of leaf rust of wheat (*Puccinia rubigo-vera tritici*) was found to be inherited as two independent dominant factors. It is noted that the mycelium of the mildew may produce a marked change in the development of the rust, uredia instead of flecks being produced in mildew-infected areas of rust-resistant plants.—(*Courtesy Biol. Abs.*)

Varieties of wheat resistant to rust [trans. title], J. COSTANTIN (*Compt. Rend. Acad. Sci. [Paris]*, 198 (1934), No. 2, pp. 130-133).—The author reviews the method of producing virus (séreh)-resistant sugarcane in Java by crossing certain agronomic canes with wild, mountain canes presumed to have acquired resistance to the virus by reason of the altitude, and discusses how this might be applied to the production of wheats resistant to the rusts *Puccinia graminis*, *P. glumarum*, and *P. triticea*.—(*Courtesy Biol. Abs.*)

Some experiments on the control of loose smut, *Ustilago tritici* (Pers.) Jens., of wheat, J. C. LUTHRA and A. SATTAR (*Indian Jour. Agr. Sci.*, 4 (1934), No. 1, pp. 177-199, figs. 2).—The results are given of experiments for loose smut control extending over several years. The presoak hot water treatment and single bath, long soak hot water method gave complete success, but are considered unadapted to the use of illiterate farmers. For use in summer on the

Punjab plains, the sun-heated water method was devised, in which the seed wheat is placed at noon in a black iron vessel which has been standing in the sun and is allowed to remain there until 4 p. m., after which it is dried. Another method was also devised for use in similar situations called the solar energy method, in which, after soaking for 4 hr. in the morning, the wheat is taken out and exposed to the sun from noon to 4 p. m. Both methods gave excellent control without significant injury to germination and are believed to be practicable for use where daily temperatures are high enough.

Sclerotial rot of corn caused by *Rhizoctonia zeae* n. sp., R. K. VOORHEES (*Phytopathology*, 24 (1934), No. 11, pp. 1290-1303, figs. 7).—This contribution from the Florida Experiment Station describes for the first time a disease of corn, occurring in Florida chiefly as an ear rot, which is similar in certain stages to the rots caused by *Diplodia zeae* and *D. macrospora*. Young ears proved to be more susceptible to artificial infection than maturing ears. Seedling corn plants were also attacked. The morphology of the fungus is described and illustrated. In culture it grew best at 33° C and at pH 6.8. Small sclerotia were abundantly produced in culture and on the host. It was found to hibernate as dormant mycelium and sclerotia in infected kernels and old plant debris in the field and in the soil. It is regarded by the author as distinct from other species of *Rhizoctonia* previously reported on *Zea mays*.

Cotton crop losses from *Phymatotrichum* root rot, W. N. EZEKIEL and J. J. TAUBENHAUS (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 9, pp. 843-858, figs. 5).—In this contribution from the Texas Experiment Station, estimation of reduction of the cotton crop by root rot caused by *P. omnivorum* is reported to be difficult because plants killed by the disease may bear a partial crop, and conditions that favor development of root rot also favor growth of the cotton plant. In an experimental plat in which the cotton was picked separately from each plant, it was found that the numbers of bolls per plant, the weight of lint per boll as well as per plant, and the weight of seed per boll as well as per plant were all lower with plants that had succumbed to root rot. Plants that succumbed 2 mo. or more before the first picking bore only an insignificant crop, plants that succumbed 5 weeks before harvest bore only half of a normal crop, while there was no observed loss from death during the 3 weeks immediately preceding harvest.

Based on statistical studies, 0.9 times the recorded percentage of plants dying from the disease is tentatively suggested for estimating crop loss in Texas. The losses in the State in 1928, estimated on this basis from data obtained in a survey through 41 counties and crop-reporter estimates from 150 counties, amounted to about 8 percent, equivalent to about 444,000 bales.

Influence of soil moisture on longevity of cotton root-rot sclerotia, C. J. KING and E. D. EATON (*Jour. Agr. Res. [U. S.]*, 49 (1934), No. 9, pp. 793-798, figs. 2).—Sclerotia of the cotton root rot fungus, *Phymatotrichum omnivorum*, were buried in soils maintained at different moisture contents (air dry and 5, 10, 25, and 28 percent on a dry-weight basis). Monthly tests for viability were made for 1 yr. Viability was preserved best at moisture contents of 25 and 28 percent, and was destroyed within 3 mo. in air-dried soil and soil with 5 percent moisture. Some sclerotia germinated spontaneously after some time in soils of 10, 25, and 28 percent moisture content, and hyphae penetrated the clay sides of the containers, forming mats of mycelium on the outside.

Cotton root rot as affected by crop rotation and tillage at San Antonio, Tex., G. T. RATLIFF (*U. S. Dept. Agr., Tech. Bul.* 436 (1934), pp. 31, pls. 2, figs. 8).—A series of rotation and tillage experiments at the U. S. D. A. San Antonio Field Station afforded an opportunity of observing the behavior of the

cotton root rot disease under various crop sequences and cultural treatments. The losses caused by the disease, as indicated by the percentage of plants killed, were recorded in connection with a total of 27 separate experiments over a period of 21 yr.

The location of plants killed by root rot in each of these experiments was recorded accurately on diagrammatic maps each year, and these provided a means of studying the occurrence and distribution of the disease throughout the 17-yr. period 1916-32. These diagrammatic maps are reproduced in the bulletin.

In many instances the natural occurrence and maintenance of the disease in the soil has exerted a greater influence on the prevalence of the disease than the rotational and cultural treatments applied, particularly in the case of the shorter rotations. In many instances the cause or causes have not been clear, although deep-seated, dead host material on which the fungus was able to maintain itself over long periods has appeared to have been a factor. Also the physical character, chemical composition, water-holding capacity of the soil, and the variation in the original infection in the different plats have materially influenced the extent of injury sustained.

In these experiments, 2-yr. rotations of cotton with nonsusceptible crops have proved of very little value in the control of root rot, 3-yr. rotations appear to have been slightly more effective, while in 4-yr. rotations the disease has been effectively checked though not eliminated.

In one experiment the disease was maintained and spread as effectively where the land was cropped to cotton only in alternate years and was held in clean fallow for a minimum period of 17 mo. as when the land was cropped to cotton each season.

Neither barnyard manure nor green manure crops proved of value in combating the losses from root rot.

Both the statistical data and the diagrams indicate that subsoiling as practiced in these experiments had little, if any, influence on the occurrence or spread of the fungus. Similarly, it appears that the time of preparation of the land, plowing, or subsoiling had no appreciable effect on the activity of the causal organism.

Cotton followed either corn, milo, oats, sorgo, or Sudan grass in the various rotations studied. The records available indicate that any difference that may have existed between these crops in their effect on the behavior of the root rot fungus was completely masked by the uncontrolled factors.

The behavior of the disease is shown to be extremely erratic, both by comparing similar treatments in different rotations and by studying identical treatments on different plats within a rotation. Certain effects appeared as the result of some treatments when considered for a period of a few years, but they failed to continue, or were reversed, over a longer period. This emphasizes the danger involved in interpreting results obtained from experiments of short duration.

The virulence of the disease appeared to be closely correlated with the availability of soil moisture.

As shown by the diagrams, root rot infection was inherently more prevalent and active in certain well-defined areas than in other adjacent areas, regardless of the treatments applied. The disease spread readily in some areas, was present but spread little in others, and did not occur at all in certain areas during the 17-yr. period.

Centers of infection persisted over long periods, irrespective of treatment as regards rotation or cultural practices. Excavation in small persistent cen-

ters produced evidence substantiating the theory that the fungus maintains itself saprophytically for long periods on deep-seated host material.

There has been a tendency for the infection to spread from year to year until large areas are involved, then "break up", and in many cases revert to the original areas of infection. There has been no definite periodicity, however.

The behavior of the root rot areas does not lend support to the theory that the disease is distributed by tillage implements or cultural practices.

A cytological study of heterothallism in flax rust, R. F. ALLEN (*Jour. Agr. Res.* [U. S.], 49 (1934), No. 9, pp. 765-791, pls. 13).—In this cooperative investigation of the U. S. D. A. Bureau of Plant Industry and the California Experiment Station, the author studied *Melampsora lini*, an autoecious, long-cycle rust having spermogonia, aecia, uredia, and telia on flax. It was found that the sporidium germinates and enters the epidermal cell, forming there a primary hypha of several uninucleate cells. This hypha branches and gives rise to intercellular, incompletely septate, haploid mycelium, the cells of which are from 1- to 4-nucleate. Haustoria contain from 1 to 7 nuclei. Spermogonia form first at the upper surface and later at the lower. In these reproductive areas the hyphae rapidly become more fully septate and are composed of predominantly uninucleate cells. These hyphae pass between the epidermis and the palisade. The spermogonium centers on a stoma. This apical stoma is used as an ostiole. Later, the epidermis over a spermogonium is sloughed off.

Flax rust was found to be heterothallic. Isolated monosporidial infections grew old and died without producing aecia, but the transference of spermatia of one sex to a mycelium of opposite sex led to the formation of aecia. From 8 to 20 days after infection, fertilization was possible, but rarely after that. In the material studied there were indications that only two sexual groups were present.

Spermatia placed upon the surface of an infection area enter, probably growing in through spermogonia, perhaps also entering through epidermal cells, and then grow into intercellular mycelium, the hyphae of which are at first very fine, but later of ordinary appearance. There were indications that spermatial hyphae obtain food from the sporidial hyphae. Twenty-four hr. after spermatization, hyphae (predominantly uninucleate) of both sexes grow out to the epidermis (either upper or lower), cut off from 1 to 4 layers of buffer cells, and then fuse by pairs to form the "two-legged cells", each of which gives rise to a chain of aeciospores. About 4 days after spermatia are placed on the surface of an infection, its open aecia are shedding spores.

On the invasion of roots of *Medicago* and *Melilotus* by *Sclerotinia* sp. and *Plenodomus meliloti* D. and S., M. W. CORMACK (*Canad. Jour. Res.*, 11 (1934), No. 4, pp. 474-480, pl. 1).—"The invasion of roots of *Medicago* and *Melilotus* by *Sclerotinia* sp. and *P. meliloti* was studied, with particular reference to the effectiveness of wound cork in arresting the progress of these pathogens. Both pathogens are apparently capable of penetrating through the uninjured external cork covering of the roots and also through any subsequently formed wound cork layers. Killing of the root tissues and retardation of wound cork development in advance of hyphal invasion was caused by both pathogens. No explanation can at present be offered as to why the advance of *P. meliloti* is checked and that of *Sclerotinia* sp. is definitely slower after good growth begins in the spring."

Aberrations in the chemical composition of peas from plants affected with root rot, Z. I. KERTESZ, J. G. HORSFALL, and A. H. ROUSE (*Jour. Agr. Res.* [U. S.], 49 (1934), No. 9, pp. 799-814, figs. 5).—At the New York State Experiment Station, chemical analyses of pea (*Pisum sativum*) samples from the

1931, 1932, and 1933 crops showed differences in the composition of peas from normal and diseased plants. The organisms *Rhizoctonia solani* and *Pythium* spp. were mostly involved. The apparently curtailed water supply of the plants resulted in peas of lower water content. Lower ash and nitrogen content and higher total carbohydrate content were found in the peas from root rot affected plants. The disease appeared to favor the translocation of carbohydrates into the ovules, which may explain the abnormal enlargement of the peas from diseased plants. A larger proportion of higher carbohydrates was found in the diseased peas.

Investigations on the virus diseases of the potato.—I, Studies with viruses belonging to the mosaic group [trans. title], E. KÖHLER (*Phytopath. Ztschr.*, 5 (1933), No. 6, pp. 567–591, figs. 15).—Four apparently independent viruses, belonging to the mosaic group and mechanically transmissible, were isolated from potatoes of various origin in Germany. Two of these were apparently identical with K. M. Smith's viruses Y and X. The other two were new, undescribed forms. Neither of the latter was transmitted by *Myzus persicae*. Petunia was susceptible to both. They are also closely related to the X virus as judged by symptoms, epidemiology, and similar behavior when combined with the G. A. virus. One of them was attenuated by passage through datura and petunia. This attenuation was not entirely lost on reinoculation to tobacco.

Cultural experiments on potatoes in the Pyrenees [trans. title], J. COSTANTIN (*Compt. Rend. Acad. Sci. [Paris]*, 198 (1934), No. 1, pp. 22–26).—Healthy seed potatoes, of known history and free from virus troubles, which had been grown in the Alps in 1932 were planted in 1933 in the Pyrenees at altitudes of 550 and 1,400 m approximately a month after the normal date for the region, thus shortening the normal growing period. In the ensuing hot, dry summer these Alpine stocks remained green and resumed growth in the favorable late summer weather.

From yield results given in tables, it is concluded that altitude increases the yield as well as the number of tubers per plant. Results of concurrent plantings of diseased stocks indicate that altitude diminishes the intensity of leaf roll and mosaic.—(Courtesy Biol. Abs.)

A new idea regarding mild leaf roll of the potato [trans. title], J. COSTANTIN (*Compt. Rend. Acad. Sci. [Paris]*, 198 (1934), No. 4, pp. 299–302).—Referring to a report in 1923 by R. G. Newton that healthy potato plants had been secured in northern latitudes (British Columbia) after several seasons of culture from stocks originally 100 percent affected by mosaic, the author discusses the results obtained in his own experimental potato plantings in the Pyrenees in 1933, where in high altitudes mosaic and leaf roll apparently attained a mild or attenuated form but were not eliminated. He glimpses in this a possibility of something in effect like vaccination of plants.

The rust spot disease of the potato [trans. title], [O.] SCHLUMBERGER (*Kartoffel*, 13 (1933), No. 8, pp. 84, 85, figs. 2).—The author reports that field investigations conducted in different places and with extensive material gave uniformly no indication of the transmission of the disease to the progeny after using affected tubers for planting stock, and that the stand and development of the plants were in no way injured by the trouble. Spread of the disease did not take place in storage, and the keeping quality of the tubers was not affected. Only when the eyes were separated by the brown layers from the rest of the tissues in severe cases was the germination injured. The injury is held to be associated with unbalanced water relations, especially in light, sandy soils and under conditions of deficient rainfall.

The relationship of *Phellomyces sclerotiphorus* and its distinction from *Spondylocladium atrovirens* [trans. title], B. HUSZ (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 44 (1934), No. 4, pp. 186-191, figs. 3).—The author presents evidence that the microstromatic black bodies, probably identical with A. B. Frank's *P. sclerotiphorus* and borne in numbers on tubers in hills of potatoes affected by *Colletotrichum atramentarium* in Hungary in 1933, are probably connected with the latter fungus and not with *S. atrovirens*.

The electrical measurement of the degree of "degeneration" of potato planting stock: A practical test with the new method of Hey and Warthenberg [trans. title], P. FRIEBE (*Pflanzenbau*, 9 (1933), No. 9, pp. 351-355, fig. 1).—A chart depicts the results obtained in tests by this method with stocks of seed potatoes whose field performance had been recorded. The laboratory tests corresponded closely with the field observations. With healthy tubers, the instrument read from 0 to 180 mv. Definitely unhealthy stock showed readings from 200 to 300 mv.

Effects of potato spraying, I, II [trans. title], C. GALLÁSTEGUI (*Prog. Agr. y Pecuario*, 40 (1934), Nos. 1814, pp. 161-165; 1815, pp. 177, 178).—The effects of 3 or 4 bordeaux applications upon the yield of different varieties in Galicia are reported. The maximum increase amounted only to 32 percent, and increases of value were confined to varieties susceptible to late blight (mostly early sorts), while more or less resistant varieties (often medium late to late) showed but little benefit in yield. The use of resistant varieties is favored rather than spraying under the conditions prevailing in the region.

Bacterial diseases of sugar cane, W. COTTRELL-DORMER (*Queensland Soc. Sugar Cane Technol. Proc.*, 3 (1932), pp. 31-38).—Leaf scald, gumming, red stripe, and mottled stripe are described, their known distribution is given, and preventive measures are discussed in a nontechnical way.

Predisposing factors in *Pythium* root rot, VII, C. W. CARPENTER (*Hawaii. Planters' Rec.*, 38 (1934), No. 4, pp. 279-338, figs. 26).—This is a report of results attained and conclusions reached in the last 4 yr. of the investigations conducted on sugarcane root rot and growth failure at the Hawaiian Sugar Planters' Experiment Station (E. S. R., 67, p. 272). Abnormal nutrition was found to precede the attack by *P. graminicolum* (*P. aphanidermatum*) on the roots of sugarcane and Sudan grass. Cane varieties differed in susceptibility to the organism and also in their tendency to abnormal nutritional upset. By modifying the nutritional environment it was possible to render certain resistant varieties of cane susceptible. When N was used in excess with a particular variety, it became susceptible to attack in virgin soil and in soils where the disease is not ordinarily observed.

Some varieties not particularly sensitive to high N, such as H 109, D 1135 and Yellow Caledonia, were particularly sensitive to low P availability. P. O. J. 2878 appeared to tolerate either high N or low P.

When *Pythium* was eliminated by chloropicrin fumigation, normal growth of Sudan grass and young cane occurred by reason of sufficient available P in the P-fixing soils studied. Reintroduction of *Pythium* into such soils induced growth depression, which was overcome by adequate P applications.

Reference is made to other work which showed that serious effects from *Pythium* root rot accompanied deficiencies of P, Fe, Ca, Mg, K, Mn, or S in culture solution work.

Excess of Ca and probably of Mg and Na, and of toxic salts of Al and Fe appeared to favor root rot.

Abundant soil moistures and relatively low soil temperatures (70° F. or lower) were found to favor the severity of root destruction by *Pythium*.

Treatment of sweet-potato plants for the control of black rot, L. E. MILES (*Phytopathology*, 24 (1934), No. 11, pp. 1227-1236).—In a 2-yr. test at the Mississippi Experiment Station, plants dipped in a suspension of *Ceratostomella fimbriata* spores and subsequently treated either by dipping the entire plant in a 25 percent copper-lime dust or by dipping the stems and roots in a 20-20-50 bordeaux mixture escaped black rot infection almost entirely with insignificant injury, even when stored up to 5 days. The method is reported practically to eliminate the spread of the disease on plants in transit.

External and internal symptoms of boron deficiency in tobacco, D. A. VAN SCHREVEN (*Tijdschr. Plantenziekten*, 40 (1934), Nos. 4, pp. 97-112; 5, pp. 113-129, pls. 3; *Eng. abs.*, pp. 122-125).—Symptoms of boron deficiency, which are described, were produced in tobacco plants of the variety Rhenen grown without boron in water cultures and in glass sand cultures in which the sand had been treated with HCl. The symptoms of boron deficiency exhibited by the plants in sand cultures agreed for the most part with those of "Top-ziekte" of Deli tobacco when the sand was not treated with HCl, the upper end of the stem generally growing to one side. It was possible to modify the intensity of the symptoms and to induce them at each stage of growth. From this fact it is concluded that tobacco plants require boron during their whole life period. In plants suffering from boron deficiency the translocation of starch is impeded.

Internal symptoms of boron deficiency were found in the apical cells and in the procambium at the growing points of the roots, and afterwards in the procambium and cambium at the growing point of the stem. They manifested themselves as a brown wall discoloration followed by a breaking down of individual cells or cell complexes. The phloem enlarged enormously, whereas the xylem was generally poorly developed. Although the stelar structure was chiefly affected, all other tissues might be involved. The thickening of the lamina resulted from the enlargement of the individual cells, in which the nucleus may enlarge and the number of the chloroplasts may be increased but remain smaller than in healthy tissue.—(*Courtesy Biol. Abs.*)

The control of the curl- and crinkle-diseases of tobacco, T. H. THUNG (*Proefsta. Vorstenland. Tabak [Dutch East Indies]*, Meded. 78 (1934), pp. 18, figs. 4; *Eng. abs.*, p. 18).—White flies (*Aleyrodidae*, and probably of the genus *Bemisia*), collected off *Ageratum conyzoides*, *Synedrella nodiflora*, and *Vernonia cinerea*, which grew some distance away from tobacco fields in Java, transmitted "curl" and "crinkle" diseases from these weeds when placed on healthy tobacco plants in cages. Similarly, it was found that *Cucumis sativus* and *Manihot utilisima* also, but only to a slight extent, were sources of infection of these virus diseases. Successful control of these virus diseases was obtained in tobacco fields by the timely eradication (mid-June, mid-July, and mid-August) of *A. conyzoides*, *S. nodiflora*, and *V. cinerea* to a distance of 50 m from the tobacco.—(*Courtesy Biol. Abs.*)

Chemical studies on the virus of tobacco mosaic.—II, The proteolytic action of pepsin, W. M. STANLEY (*Phytopathology*, 24 (1934), No. 11, pp. 1269-1289, figs. 2).—Continuing studies already cited (*E. S. R.*, 72, p. 643), the author found that pepsin had no appreciable effect on the infectivity of tobacco mosaic virus or its strains, including aucuba mosaic, a yellow and a masked strain, at pH 7 and pH 8, as measured on *Nicotiana glutinosa*, but slowly inactivated it at pH 4 and 37° C., and rapidly at pH 3 and 37°, while it failed to produce inactivation at pH 3 and -15°, even on prolonged standing. The rate of inactivation was found to be proportional to the concentration and activity of pepsin and to the time of digestion. Pepsin-virus digestion mixtures

containing inactive virus had no appreciable immediate effect on the infectivity of virus added to them. Attempts to restore the infectivity of virus inactivated by pepsin failed.

From the evidence it is concluded that the inactivation is due to the proteolytic action of pepsin. This suggests that the virus of tobacco mosaic is a protein, or very closely associated with a protein, which may be hydrolyzed with pepsin.

Increase of tobacco-mosaic virus in the absence of chlorophyll and light. F. O. HOLMES (*Phytopathology*, 24 (1934), No. 10, pp. 1125, 1126).—Typical necrotic primary lesions were formed in chlorophyll-free areas on leaves of variegated *Capsicum frutescens* inoculated with tobacco mosaic virus. Virus was found to increase in the absence of light in inoculated, chlorophyll-free, etiolated stems of Green Mountain potatoes, grown in the dark, and in whole normal tomato plants, in the absence of light.—(*Courtesy Biol. Abs.*)

Specific quantitative neutralization of the viruses of tobacco mosaic, tobacco ring spot, and cucumber mosaic by immune sera. K. S. CHESTER (*Phytopathology*, 24 (1934), No. 11, pp. 1180–1202, figs. 10).—By a new technic, which is described, it was clearly demonstrated that normal rabbit serum inhibits virus infectivity through decreasing the susceptibility of the host, a property shared by healthy tobacco extract, ovalbumin, and milk, but not through an effect on the virus. Virus-immune serum, however, showed not only the same type of effect but also a specific neutralizing effect on the virus used in its preparation, which normal serum lacks. Each of the viruses used in these tests was neutralized by its homologous antiserum, but not by heterologous antisera. The serum titers reached 1:2,500 or higher with tobacco mosaic. With the virus amount held constant, the degree of neutralization was found to vary directly with the concentration of the immune serum. Symptomless, ordinary, and white strains of tobacco mosaic were indistinguishable by this reaction. The same was true for two strains of cucumber mosaic.

Seed transmission of *Verticillium* wilt of eggplants and tomatoes. K. J. KADOW (*Phytopathology*, 24 (1934), No. 11, pp. 1265–1268, fig. 1).—In this study at the Illinois Experiment Station, seeds were removed aseptically from diseased fruits of both eggplants and tomatoes and plated on 2 percent dextrose agar. Other seeds separated from diseased fruits by the usual fermentation process were sterilized externally before plating. In both sets *Verticillium* grew out from a considerable proportion of the seeds in all lots. Limited tests with eggplant seeds indicated that immersion in water at 120° F. for 20 min. may prove effective for seed sterilization.

Contributions on the asparagus rust [trans. title], G. GASSNER and K. HASSEBRAUK (*Gartenbauwissenschaft*, 8 (1934), No. 3, pp. 455–476, figs. 3).—This is a summary of existing knowledge regarding *Puccinia asparagi*, to which are added facts derived from the investigations of the authors on the epidemiology and control of the disease. A bibliography is given.

The control of club root (finger-and-toe) in cauliflowers. N. C. PRESTON (*Jour. Min. Agr. [Gt. Brit.]*, 41 (1934), No. 4, pp. 329–335, pls. 2).—The article summarizes the results of cooperative trials by advisory mycologists in England and Wales during 1932. Different varieties of cauliflower suitable to the particular localities were used and the young plants grown in contaminated soil. Just previous to sowing, half of the rows were treated with corrosive sublimate (1:2,000), 1 pt. to every 5 ft. of row in frames and at double this rate in open seedbeds. This was followed by a second application at double the rate of the first, made between the rows when the plants were about 2 in. high. As the

seedlings were transplanted into the field, a third application was made by pouring 0.5 pt. of the solution into each hole. The treated plats averaged 74 percent marketable heads, while the untreated ones yielded only 25 percent. and the relative weights of the heads were 1.8 lb. and 0.7 lb., respectively.—(*Courtesy Biol. Abs.*)

Inoculation tests with Verticillium wilt of muskmelons, J. B. KENDRICK and F. R. SCHROEDER (*Phytopathology*, 24 (1934), No. 11, pp. 1250-1252).—A serious wilt disease of Persian muskmelons (*Cucumis melo*) in San Joaquin County, Calif., in 1932 was shown to be due to *V. alboattrum*. Hale Best and Honey Dew varieties growing in the same field did not show the disease. However, in greenhouse trials in which seed was planted in soil uniformly mixed with a culture of the organism, Casaba, Hale Best, Honey Dew, and Persian all proved highly susceptible, with Honey Ball a little less so but in no sense immune.

The use of formaldehyde dust in controlling onion smut, J. D. WILSON (*Ohio Sta. Bimo. Bul.* 172 (1935), pp. 6-12).—Experiments conducted to determine the usefulness of formaldehyde applied in a dust carrier as compared with formaldehyde applied in a liquid treatment for the control of infection by the soil-borne *Urocystis cepulae* showed that dust-treated plats yielded less than those treated with the liquid in years of low soil moisture, not entirely because of lesser disease control but because of a greater reduction in stand. In a soil wet at planting time, however, the situation was found to be reversed, and more disease-free onions appeared in the plats receiving the dust treatment. Damping-off, which was severe in untreated rows, was largely checked by each of the formaldehyde treatments.

A considerable number of other materials were tested out, but none proved as effective as the formaldehyde treatments.

The author concludes that in years when the soil moisture content is high at planting time, the substitution of the dust treatment may be of advantage, but if the soil is not wet, the greater ease of application of the liquid treatment, its smaller cost, and lesser injury to seed germination make it more desirable than the dust.

Important diseases of pepper in Georgia, B. B. HIGGINS (*Georgia Sta. Bul.* 186 (1934), pp. 20, pls. 2, figs. 6).—This bulletin describes the more important diseases of pepper so that they may be recognized by the grower, and gives the latest development in methods of control. It deals with damping-off (*Rhizoctonia solani*), southern blight or *Sclerotium* blight (*S. rolfsii*), nematode root knot (*Heterodera radiculicola*=*H. marioni*), downy mildew or blue mold (*Peronospora* sp.), mosaic (virus), blossom-end rot (physiological), internal mold, sunscald, *Cercospora* leaf spot (*C. capsici*), bacterial spot (*Bacterium vesicatorium*), anthracnose (*Gloeosporium piperatum*), and ripe rot (*Vermicularia capsici*).

Colored illustrations effectively present the characteristic symptoms on the fruit.

As practical control measures, seed selection, seed treatment, sanitation, spraying, and crop rotation are discussed.

Tomato fruit rot due to Cladosporium fulvum [trans. title], E. REINMUTH (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 44 (1934), No. 11, pp. 558-560, figs. 2).—Two cases are reported where yellowish, flattened, often circular areas developed on the fruit opposite the calyx end. No spores were produced until the fruits were placed in a moist chamber, after which the affected areas became covered with typical spores of *C. fulvum*.

Winter injury to trees can be modified, R. P. WHITE (*N. J. Agr. [New Jersey Stat.]*, 16 (1934), No. 6, p. 2).—This contribution from the New Jersey

Experiment Stations discusses some of the effects of the unusually low temperatures of the winter of 1933-34 in New Jersey. Reference is made to the improved resistance shown by well-fertilized trees.

Note on the bitter rot of the apple (*Glomerella cingulata*) [trans. title], J. C. LANDQUIST (*Rev. Facult. Agron. La Plata, 3. ser., 19 (1933), No. 3, pp. 338-406, figs. 5*).—The author describes the disease which has already appeared in Argentina, and suggests control practices based on work in the United States.

Sour-cherry spraying, J. O. ANDES (*Tennessee Sta. Circ. 50 (1934), pp. 4, fig. 1*).—The results of experiments for the control of *Coccomyces* leaf spot on cherries in 1931 and 1932 showed bordeaux mixture to be superior in preventing leaf infection and defoliation to lime-sulfur or flotation sulfur. Tests in 1934 showed the advantage of early-season sprays over summer sprays. The use of lime-sulfur 1-40, before harvest, with bordeaux mixture 4-6-50, after harvest, gave excellent control. Four sprays with malachite green 1-5,000 gave as good control in this test as did a like number of applications of bordeaux mixture.

The author recommends lime-sulfur at the time of shuck fall and bordeaux mixture immediately after harvest and again 4 weeks later.

The treatment of grape downy mildew by copper sprays [trans. title], J. BRANAS and J. DULAC (*Compt. Rend. Acad. Agr. France, 20 (1934), No. 1, pp. 33-39*).—It is concluded that the lack of success in the control of *Peronospora viticola* may be attributed to the fact that the spray materials now in use cannot supply sufficient copper concentration to meteoric water to assure protection, such required concentration, according to evidence brought forward, being greater than had hitherto been considered adequate to accomplish the desired results.

On the method of action by copper sprays against mildew [trans. title], J. DUBACQUIÉ (*Compt. Rend. Acad. Agr. France, 20 (1934), No. 28, pp. 944, 945*).—Evidence is presented that the spores of the downy mildew of the grape are able to decompose the spray film and set free more than enough copper to prevent their germination.

Some experiments on the combined effect of *Diplodia* and green mould inoculations on oranges, D. L. ELZE (*Hadar, 7 (1934), No. 9, pp. 223-225*).—One series of oranges was inoculated with *D. natalensis*, one with *Penicillium digitatum*, and a third with both. The combination accelerated decay. *Diplodia* attack was thought to render fruits more liable to *Penicillium* invasion.

The action of various elements on the bacterial galls of *Pelargonium* [trans. title], A. GOSSET, J. MAGROU, and A. TCHAKIRIAN (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 12, pp. 1097-1100*).—Rapid and sometimes complete necrosis of galls caused by *Bacterium tumefaciens* on geranium was produced, without harm to vigorous plants, by injecting into the galls compounds of Ge, Ce, Mo, Sn, Zr, and Al. Only Ge produced gall necrosis when introduced into the vascular system of the plant. Higher concentrations than necessary for gall necrosis did not stop the growth of *B. tumefaciens* in culture, but only slowed it down slightly.

The range and importance of *Nectria* canker on hardwoods in the Northeast, D. S. WELCH (*Jour. Forestry, 32 (1934), No. 9, pp. 997-1002, fig. 1*).—This paper discusses the effect of *Nectria* of the type commonly referred to as *N. ditissima* or *N. galligena*, with *Cylindrocarpum* as the conidial stage, on such trees as red and black oak, yellow and black birch, paper birch, and basswood which have been subjected to serious damage in various localities. Saprophytic development was found to involve large areas of the trunk after the trees have been cut, and on trees that have been killed.

The author holds that an understanding of the disease is essential to the intelligent application of silviculture to young hardwoods in the Northeast.

Principal fungus diseases of forest species of Sochi region, North Caucasus [trans. title], F. A. SOLOV'EV (*Trudy Issledov. Lesnomu Khoz. Lesnoi Promysh* (Mitt. Leningrad. Inst. Wiss. Forsch. Geb. Holzindus.), No. 14 (1931), pp. 171-191, figs. 15).—The fungi found attacking *Castanea*, *Taxus*, *Buxus*, *Juglans*, *Ostrya*, *Abies*, *Prunus*, and *Fagus* are listed and discussed. Several are illustrated.

Enzymes of the rhizomorphs of *Armillaria mellea*, W. M. LANPHERE (*Phytopathology*, 24 (1934), No. 11, pp. 1244-1249).—Rhizomorphs growing out from a Douglas fir curbing as a mat into the water in a shallow well yielded diastase, inulase, invertase, rennet, oxidase, peroxidase, and catalase. Hemiacellulase, maltase, lactase, and the esterases were tested for but not found. The basis on which the rhizomorphs were considered as belonging to *A. mellea* is not indicated.

The Dutch elm disease, *Graphium ulmi*, in Connecticut, G. P. CLINTON and F. A. McCORMICK (*Science*, 81 (1935), No. 2090, pp. 68-70).—An historical account is given of the discovery of the disease in the fall of 1933 in this State and of the results of subsequent investigations through the year 1934 conducted by the Connecticut [New Haven] Experiment Station and the U. S. Department of Agriculture. At the end of 1934 the disease was known only from the Stamford-Greenwich area nearest the New York-New Jersey infection area and in one tree at Old Lyme some 50 miles distant, although every one of the 169 towns of the State had been visited. All trees found infected were destroyed. At Old Lyme the known carrier of the disease, *Scolytus multistriatus*, was not found, but a native beetle, *Hylurgopinus rufipes*, and its larvae were present in the affected tree, and when the beetles were placed in test tubes with healthy twigs of elm the latter became infected. The authors also have produced the coremial stage of *G. ulmi* by spraying pure cultures of the spores in the inner bark of the elm in moist chambers.

The resistance of saplings and certain seedlings of *Pinus palustris* to *Septoria acicola*, A. F. VERRALL (*Phytopathology*, 24 (1934), No. 11, pp. 1262-1264).—The resistance of saplings and certain seedlings of *P. palustris* to the leaf spot fungus *S. acicola* was found to correspond with the ability of their leaves to produce more resinous materials than those of susceptible individuals. On other species of *Pinus* the resistant (bar-spot) type of lesion was found more common on those that produce the most resin.—(*Courtesy Biol. Abs.*)

Studies in spike disease of sandal: Methods of inoculation and variation of results under different methods, M. G. VENKATA RAO and K. G. IYENGAR (*Indian Forester*, 60 (1934), No. 10, pp. 689-701).—Successful twig grafting resulted in 100 percent transmission. Budding, bark grafts, and leaf insertion resulted in failure to transmit in a considerable proportion of the cases, even where organic union occurred with material from diseased trees. The probable reasons are discussed.

Pathological enlargement of resin canals in *Picea*, J. B. PRINCE (*Forestry Chron.*, 10 (1934), No. 2, pp. 129-136, pls. 2, fig. 1).—Horizontal resin ducts from 2 to 16 times the diameter of the normal ducts present are reported for *P. engelmanni* from British Columbia and for *P. glauca* from eastern Canada. The author is inclined to the view that they were the result of fungus infection of the cambium of these spruces.

New host plants of the leaf nematodes *Aphelenchus ritzemabosi* and *A. olesistus* [trans. title], H. PAPE (*Gartenbauwissenschaft*, 8 (1934), No. 3, pp. 477-487, figs. 5).—The host plants recorded by various workers are tabulated. New hosts here recorded for *A. ritzemabosi* are *Incarvillea delavayi*,

Heuchera sanguinea, *Rudbeckia nitida*, *Anemone sylvestris*, and *Lamium album* [maculatum ?]; and for *Aphelenchus olesistus* are *Omohalodes verna*, *Anemone vitifolia*, *Doronicum plantagineum*, *Primula anisiaca*, *R. neumanni*, and *Paeonia sinensis* [albiflora ?]. The author's experience supports the opinion of others that the two species may be only different races of the same species.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A plan for the management of brown bear in relation to other resources on Admiralty Island, Alaska, B. F. HEINTZLEMAN and H. W. TERHUNE (*U. S. Dept. Agr., Misc. Pub. 195* (1934), pp. 20, figs. 3).—The plan worked out and here described provides for the management of the brown bears of Admiralty Island, in the Tongass National Forest, Alaska. It coordinates the management of the bears with other present and prospective activities on the island and more specifically provides that all activities, including bear hunting, shall be so regulated as to insure the perpetuation of the animals in satisfactory numbers. The management of the bears of the island under this plan is a cooperative project between the Alaska Game Commission and the Alaska regional office of the Forest Service, both of which function under the Department of Agriculture.

Studies on the normal blood of foxes, A. H. KENNEDY (*Ontario Dept. Game and Fisheries Bul. 6* (1933), pp. 47, figs. 18).—The several chapters of this contribution deal with methods and technic (pp. 7–10), the morphology of the blood elements (pp. 10–16), tables (pp. 17–35), the numbers of the blood elements (pp. 36–41), the normal nuclear index (pp. 41–44), and the normal filament and nonfilament polymorphonuclear neutrophile count (pp. 44, 45). A bibliography of 33 titles is included.

Notes on food of red foxes in New York and New England, W. J. HAMILTON, JR. (*Jour. Mammal.*, 16 (1935), No. 1, pp. 16–21).—In a study commenced in 1927 analyses were made of the contents of 206 stomachs of red foxes killed from October to March, largely in the late fall or early winter. The frequency of occurrence of the various food items and the percentage of bulk each occupies in the total food volume are recorded in detail in tabular form. Mice were identified in 83 of the 206 foxes, making up 29.3 percent of the bulk, followed by rabbits, which were found in 56 and made up 22.1 percent of the bulk.

The distribution of the muskrat (*Fiber zibethicus*) in the British Isles, T. WARWICK (*Jour. Anim. Ecol.*, 3 (1934), No. 2, pp. 250–267, pls. 2, figs. 6).—A report of a survey made of the muskrat, introduced for fur-farming purposes into the British Isles, which has escaped and spread from several centers during the last few years. Various measures have been adopted for its control.

Epidemic disease among voles (*Microtus*) with special reference to *Toxoplasma*, G. M. FINDLAY and A. D. MIDDLETON (*Jour. Anim. Ecol.*, 3 (1934), No. 2, pp. 150–160, pl. 1).—In an investigation conducted during a period of mortality among wild voles (*M. agrestis*) in Scotland and North Wales, cysts of a toxoplasma (a parasitic protozoan) were found in their brains and were the only apparent cause of death. The form discovered is described as *T. microti* n. sp. It was found possible to transmit the organism to healthy voles and to guinea pigs and rabbits by means of brain emulsions and heart blood.

[Report of work with birds and mammals at the Iowa Station], P. L. ERRINGTON (*Iowa Sta. Rpt. 1934*, pp. 98, 99, 100, 101).—The work of the year referred to (*E. S. R.*, 71, p. 503) includes that on the ecology of wild ducks and other waterfowl, the ecology of gallinaceous game birds (bobwhite quail and pheasants), and food habits of the great horned owl, marsh hawk, and foxes.

The eggs of Japanese birds, VIII-X, K. KOBAYASHI and T. ISHIZAWA (*Rokko, Kobe, Japan: Keisuke Kobayashi, 1934, pts. 8, pp. [1]+99-105, pls. 4; 9, pp. [1]+107-116, pls. 6; 10, pp. [1]+117-127, pls. 7*).—A continuation of the work previously noted (*E. S. R.*, 70, p. 802).

Food and feeding habits of the barred ground dove, C. G. MANUEL (*Philippine Jour. Sci.*, 55 (1934), No. 1, pp. 69-77, pl. 1).—The author has found the food of *Geopelia striata* (L.), a species abundant in and near rice paddies, to consist of seeds of rice and weeds. Volumetric analyses indicate that weeds constitute the bulk of their food. The species is a ground feeder, the rice seeds being taken from the stubble, indicating that it is of neutral importance in its feeding habits. The findings are based upon field observations and the examination of 305 stomachs of doves collected in 56 places in 10 Provinces, all on Luzon Island.

A key to species of American owls, L. KELSO ([*Washington, D. C.: Author*], pp. 101, pls. [8]).—Following a brief introduction, an artificial key to owl genera and keys to the species represented in the Americas (pp. 13-28), notes on habits of the cholibá screech owls (pp. 69-74), the relation of the diurnal habit to latitudinal distribution, habitat, and abundance of American owls (pp. 75-85), and notes on habits of the spectacled owl and its relatives (pp. 87-96) are presented.

A list of the owls of the Americas with their vernacular names and range, prepared by E. H. Kelso (pp. 31-68), includes references to original descriptions and characters for only those subgenera, species, and subspecies which have been added since the publication of Cory's catalog (*E. S. R.*, 42, p. 847).

Shadowy birds of the night, A. WETMORE (*Natl. Geogr. Mag.*, 67 (1935), No. 2, pp. 217-240, pls. 8, figs. 5).—This tenth contribution (*E. S. R.*, 72, p. 652), which deals with the owls, is illustrated by paintings by A. Brooks.

The winter starling roosts of Great Britain, 1932-1933, B. J. MARPLES (*Jour. Anim. Ecol.*, 3 (1934), No. 2, pp. 187-203, figs. 4).—In an investigation of the major starling roosts in Great Britain during the winter of 1932-33, 285 were located, almost all of which were below the 600-ft. contour line. "The effect of roosting starlings on the trees, on other birds, on predatory animals, and in scattering the seeds of plants is considered. A brief account of past changes in numbers of starlings is given, and their relation to agriculture based on various analyses of food is discussed. As their rate of increase is less, it does not appear that any drastic thinning of their numbers is necessary at present.

"The starling roosts of Greater London are considered apart from the rest. About 20 roosts are recorded with an estimated total population of 15,000 to 20,000 birds. Mention is made of various methods employed in driving starlings away from a roost."

Food habits of six common lizards found in Los Baños, Laguna, Philippine Islands, D. V. VILLALOLID (*Philippine Jour. Sci.*, 55 (1934), No. 1, pp. 61-67).—A table is presented which shows the actual composition of the stomach contents of six species of lizards collected in Los Baños and vicinity, also a table showing the relative abundance of the food constituents. All of the six species examined were found to be insectivorous, the bulk of the food from 126 stomachs dissected having consisted of hexapods.

The aquatic migration of the toad Bufo americanus Le Conte, E. A. MAYNARD (*Copeia*, No. 4 (1934), pp. 174-177, fig. 1).—Observations of the routes of toad migration from stream to breeding ponds are charted and described.

The winter food of brown trout (Salmo trutta L.), H. D. SLACK (*Jour. Anim. Ecol.*, 3 (1934), No. 1, pp. 105-108).—The author reports upon examina-

tions made of the stomachs of 106 brown trout (*S. trutta*) collected from the River Test, 100 during the period November to March and 6 during the month of May.

"The predominant organisms forming the food of trout are those which are most abundant and generally distributed in the river. In the material collected during the winter, nymphs of Ephemeroptera occurred to a lesser extent than would be inferred from their abundance at that period. The principal difference between the winter and summer records is an increase in the number of Ephemeroptera nymphs and imagines in the latter."

Notes on mosquito fish in Utah, *Gambusia affinis* (Baird and Girard), D. M. REES (*Copeia*, No. 4 (1934), pp. 157-159).—Several introductions of the top-feeding minnow *G. affinis* into Utah aimed at mosquito control appear to have resulted in its establishment in Salt Lake City.

A twenty-five year balance sheet for economic entomology, L. B. UICHANCO (*Philippine Agr.*, 23 (1934), No. 5, pp. 419-429, figs. 2).—This is a brief review of the accomplishments in the field of economic entomology in the Philippines since the establishment of the College of Agriculture of the University of the Philippines in June 1909.

The renewal and replacement of the stylets of sucking insects during each stadium, and the method of penetration, A. D. HERIOT (*Canad. Jour. Res.*, 11 (1934), No. 5, pp. 602-612, figs. 14).—A contribution from the Dominion Entomological Branch, Department of Agriculture, Ottawa, Canada.

[Work with economic insects at the Arkansas Station] (*Arkansas Sta. Bul.* 312 (1934), pp. 34-38).—The work of the year referred to (E. S. R., 71, p. 503) includes that with the strawberry crown borer and the rough-headed cornstalk beetle, both by W. J. Baerg; the rice water weevil, by D. Isely and H. H. Schwardt; the relation of earliness of cotton to bollweevil injury, by Isely; and the life history of the horsefly *Tabanus stygius* Say, by Schwardt.

[Work in entomology at the Colorado Station] (*Colorado Sta. Rpt.* 1934, pp. 17-19).—Brief reference is made to the occurrence of and control work of the year (E. S. R., 70, p. 648) with the onion thrips, the potato psyllid and psyllid yellows, and the use of pyrethrum and rotenone in combating insects on cabbage and cauliflower.

Insects of Indiana for 1932, J. J. DAVIS (*Ind. Acad. Sci. Proc.*, 48 (1932), pp. 213-225).—An account is given of the insects of economic importance that came to attention in Indiana in 1932.

[Report on work in entomology at the Iowa Station] (*Iowa Sta. Rpt.* 1934, pp. 92-98, 99, 101-103).—The work of the year referred to (E. S. R., 71, p. 503) includes white grub investigations, by C. J. Drake and E. V. Collins; time and labor factors involved in gathering, ripening, and storing honey by honeybees and the influence of meteorological factors upon honey production, both by O. W. Park; bionomics and control of the apple maggot and codling moth experiments, both by C. H. Richardson; the biology and control of onion insects, by Drake; nutrition and metabolism of insects (housefly) and insecticides and insect toxicology, both by Richardson; stock replacement in honeybees and studies on the races of bees, both by Park; survey of potato insects (potato stalk borer and potato tuber worm), by Drake; ecology and control of sod webworms in permanent pasture and cultivated crops, by G. C. Decker; a study of injurious grasshoppers, by Drake and Richardson; a forest insect pest survey, by Drake and Decker; the gladiolus thrips and other pests of gladiolus, by Drake and Richardson; and bionomics and control of the chinch bug, by Drake, Richardson, Decker, and H. M. Harris.

Montana insect pests for 1933 and 1934, A. L. STRAND (*Montana Sta. Bul.* 294 (1934), pp. 40, figs. 8).—The greater part of this report of the State entomologist of Montana (E. S. R., 69, p. 232) relates to the occurrence of and control work with grasshoppers, including the organization of the 1934 campaign, control by poisoned bait and by the use of mechanical bait spreaders, plowing as a supplement to the bait method, and the value of egg surveys. Other insect pests considered include Say's stinkbug, Mormon cricket, pale western cutworm, beet leaf hopper, an unidentified sugar beet maggot, beet webworm, Colorado potato beetle, cabbage maggot, imported cabbage worm, cabbage aphid, black cherry aphid, black cherry fruit fly, oyster-shell scale, codling moth, and several insects attacking shade trees and ornamentals, particularly the Virginia creeper leaf hopper *Erythroneura ziczac* Walsh.

[Report of work in entomology and limnology by the Cornell Station] (*[New York] Cornell Sta. Rpt.* 1934, pp. 85-94).—The work of the year briefly referred to (E. S. R., 70, p. 802) includes that with clothes moths, the columbine borer and the iris borer, and carpet beetles, all by G. W. Herrick and G. H. Griswold; the gladiolus thrips, by Herrick and F. R. Shaw; the alfalfa snout beetle, by P. W. Claassen and C. E. Palm; the life history and ecological relationships of the alewife in Seneca Lake, by G. C. Embody and T. T. Odell; control of fish hatchery diseases, by Embody, J. R. de la Torre Bueno, G. Van Vleet, and D. G. Pasko; propagation of *Daphnia* as food for bass, by Embody; transmission of fowl pox by bloodsucking insects, by R. Matheson, A. L. Brody, and E. L. Brunett; granulation of honey, by E. F. Phillips; effect of temperature on bee activities, by A. W. Woodrow; and tarnished plant bug injury to celery, insects attacking potatoes on Long Island, millipedes and scab gnats and their relation to potato tuber defects, wireworms and their injuries to potatoes, muck land potato spraying experiments, onion thrips, plant varietal resistance to insect attacks, and effects of temperature and humidity on insect development, all by G. F. MacLeod.

[Report of work with economic insects at the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 308 (1934), pp. 22, 23).—Brief reference is made (E. S. R., 70, p. 356) to the progress of control work with the codling moth by the use of sprays, bands, and scraping and pruning, by H. N. Worthley; tests of four brands of tar distillate sprays for the control of aphids, by S. W. Frost; and to the occurrence and control of the principal species of injurious wireworms in the State and to mushroom insects, both by C. A. Thomas.

[Report of work in entomology by the South Carolina Station] (*South Carolina Sta. Rpt.* 1934, pp. 56-64, 100-102, 143, fig. 1).—The work of the year reported upon (E. S. R., 71, p. 68) includes that with the southern cornstalk borer, the rice weevil in corn, bollweevil hibernation, and the oriental fruit moth, all by O. L. Cartwright; studies of the bella moth *Utetheisa bella* L. at Florence, by J. E. Webb; biology and control of thrips with special reference to cotton, an account relating to which has been noted (E. S. R., 72, p. 506), and the cotton flea hopper, both by J. G. Watts; thrips on onions; the Mexican bean beetle, by F. Sherman and J. N. Todd; and the bollweevil and miscellaneous cotton insects, by F. F. Bondy and C. F. Rainwater; and cabbage insect control and harmful insecticide residue studies, by W. J. Reid, Jr., and C. O. Bare.

[Report of work with economic insects in Canada] (*Canada Min. Agr. Rpt.*, 1932-33, pp. 47-55).—A brief general account is given of the work with economic insects for the year ended March 31, 1933.

The biological control of injurious insects and plants, and the work of Farnham House Laboratory, W. R. THOMPSON (*Empire Cotton Growing Rev.*,

11 (1934), No. 3, pp. 180-187).—A general discussion of the subject with particular reference to the work of the laboratory since its foundation in 1927.

Entomological investigations, J. S. DASH (*Brit. Guiana Dir. Agr., Admin. Rpt., 1933*, pp. 25, 26).—A brief reference is made to the several crop pests that received attention during the year.

Report of the entomological division for the year 1933, F. A. SQUIRE (*Brit. Guiana Dept. Agr., Div. Rpts., 1933*, pp. 123-128).—An account is given of the occurrence of and control work with the principal pests affecting sugarcane, rice, pineapples, coconuts, etc. (E. S. R., 71, p. 218).

Report on the work of the division of plant pest control, F. P. JEPSON ([*Ceylon*] *Dir. Agr., Admin. Rpt., 1933*, pt. 4, Ed., Sci., and Art (D), pp. 106-123).—This report of the year includes an account of control work with the tea tortrix (*Homona coffearia*) recording the number of egg masses collected in planting districts, nettle grubs, black beetle, red weevil, coconut caterpillar attacking coconuts, banana root borer, plantain stem weevil (*Odoiporus longicollis*) attacking plantains, etc.

Greenhouse pests and their control, L. HASEMAN and E. T. JONES (*Missouri Sta. Bul. 342* (1934), pp. 32, figs. 14).—A practical account of the insects attacking vegetables, flowers, and other plants grown under glass.

A general account of the pests on willows at Syston, Leicestershire, A. ROEBUCK (*Jour. Anim. Ecol., 3* (1934), No. 2, pp. 182-186, pl. 1, fig. 1).—Brief notes on the insect enemies of the willow are included in this account.

Entomological factors affect salvaging of fire injured trees, K. A. SALMAN (*Jour. Forestry, 32* (1934), No. 9, pp. 1016, 1017).—This is a brief account of a 4-yr. study made of selected fire-injured ponderosa pine trees on the site of the Sugar Hill fire of July 1929 in the Modoc National Forest, Calif.

"Fire-injured trees that might survive if not attacked by insects have, according to the results of the study, different degrees of susceptibility to insect attack. Mortality due to the western pine beetle (*Dendroctonus brevicornis* Lec.), the species chiefly responsible for the insect damage to trees in the area studied, varied with the amount of foliage injury and more particularly with the amount of cambium injury caused by the fire. When foliage injury alone occurred, trees having 0 to 25 percent of the foliage injured lost only 8.7 percent of the total number of trees in that class, while those having the same amount of foliage injury but relatively heavy cambium injury suffered a 10-percent loss. In the group of trees with 25 to 50 percent foliage injury, those with slight cambium injury lost 3.6 percent, while those with moderate to heavy injury suffered a loss of 13.3 percent of the total. In the group with 50 to 75 percent foliage injury the loss was 18.2 percent for those without cambium injury and 37.5 percent for those with that type of injury. The most severely injured group studied, that having 75 to 100 percent of the foliage and a small proportion of the buds killed, lost 19.2 percent of the total number of trees in the class, while those with cambium injury in addition to the foliage injury lost 72.2 percent."

Review of United States patents relating to pest control, [January-December 1934], R. C. ROARK (*U. S. Dept. Agr., Bur. Chem. and Soils, Rev. U. S. Pat. Relat. Pest Control, 7* (1934), Nos. 1, pp. 7; 2, pp. 10; 3, pp. 9; 4, pp. 8; 5, pp. 11; 6, pp. 10; 7, pp. 8; 8, pp. 5; *Bur. Ent. and Plant Quar., 7* (1934), Nos. 9, pp. 8; 10, pp. 9; 11, pp. 10; 12, pp. 10).—These reviews covering the year 1934 are in continuation of those previously noted (E. S. R., 71, p. 70).

Treatment of seeds and plant cuttings with coal tar-kerosene emulsion as a protection against certain insects, V. J. MADRID (*Philippine Agr., 23* (1934), No. 7, pp. 604-612).—The destruction of seeds in seed beds and the attack of most woods that come in contact with the ground, plant cuttings before

germination, and occasionally growing crops led to the studies of ants and termites at the experiment station of the University of the Philippines here presented.

It was found that immersing seeds from a few minutes to 1 hr. in a 1:10 solution of coal tar-kerosene emulsion, as described by Uichanco (E. S. R., 69, p. 825), provides an adequate protection against ants. The same treatment of plant cuttings keeps them free from termite damage in the soil. "Immersion of seeds and plant cuttings in a 1:10 solution of coal tar-kerosene emulsion from a few minutes to 1 hr. does not materially affect viability. Initial infestation in the untreated lots of plant cuttings began about 3 weeks after planting, while the cuttings were still fresh, and continued until the plants had more or less established growth. The treated cuttings enjoyed a very much longer period of immunity, and whatever attack developed later was apparently subsequent to death. Initial infestation of untreated seeds began in from 3 to 6 hr. after exposure to ants; in the treated seeds, ants began to come 3 days later, but without causing injury."

Incompatibility of molasses with sodium fluosilicate and lead arsenate, L. B. RIPLEY and G. A. HEPBURN ([*Union So. Africa Dept. Agr.*], *Sci. Bul.* 130 (1934), pp. 2, fig. 1).—This contribution has been prepared with a view to warning entomologists against the use of treacle in insecticidal baits unless it be definitely known that the impurities in the treacle will not lower the toxicity of the poison employed.

The status of knowledge of pyrethrum as an insecticide [trans. title], L. SPRENGEL (*Anz. Schädlingssk.*, 10 (1934), Nos. 1, pp. 1-7; 2, pp. 14-21; 10, pp. 111-117).—This is a review of the subject presented in connection with a list of 92 references to the literature.

The loss of toxicity of pyrethrum dusts on exposure to air and light, F. TATTERSFIELD (*Jour. Agr. Sci. [England]*, 22 (1932), No. 2, pp. 396-417).—In further studies (E. S. R., 62, p. 244; 66, p. 348) conducted at the Rothamsted Experimental Station, the author has found that "pyrethrum powders and dusts, prepared by grinding or by the incorporation of extracts of pyrethrum flowers upon absorbent earths, such as talc and kieselguhr, lose their insecticidal activity on exposure to light and air. The loss is more rapid in the case of artificially prepared dusts than with ground flower heads.

"Both light and air play an important part in the process of inactivation, as samples of kieselguhr-pyrethrum and talc-pyrethrum dusts stored in closed vessels in the dark or exposed to air in the dark are relatively stable; also samples exposed to light in an atmosphere of carbon dioxide, nitrogen, or in vacuo lose little of their toxicity under the same conditions of illumination; samples exposed in oxygen, however, rapidly lose their activity. Both wet and dry oxygen were effective in destroying the activity of the dusts, but apparently at different rates, and there is some suggestion that the type of reaction may be different in the two cases. The incorporation of antioxidants with talc-pyrethrum and kieselguhr-pyrethrum dusts retards loss of activity due to exposure to light and air. Such compounds as pyrocatechol, resorcinol, hydroquinone, [and] pyrogallol confer a large measure of protection against loss of toxicity. Phenol and phloroglucinol were not effective. Tannic acid exerted a considerable measure of protection. The protection was greater in the case of artificially prepared dusts than with ground pyrethrum flowers, although it seems also to be exerted to some extent in the latter case. There is no conclusive evidence that antioxidants, naturally occurring in pyrethrum, play any great part in stabilizing the pyrethrins against inactivation. The greater part of the protection would appear to be due to particle size or to cellular inclusion."

The loss of activity of pyrethrum, II, F. TATTERSFIELD and J. T. MARTIN (*Jour. Agr. Sci. [England]*, 24 (1934), No. 4, pp. 598-626, figs. 5).—In a further study (see above) pyrethrum flowers, both finely and coarsely ground and as whole heads, were exposed under various conditions for different periods up to 1 yr. There was found to be “a relatively rapid loss of pyrethrin I in cases where the ground flowers were exposed to sunlight and air, but when stored in covered trays or tins the loss of pyrethrin I was much slower. The pyrethrins undergo change at a slower rate in flowers stored as whole heads than in the ground state. Pyrethrinized dusts and ground flower heads lose their pyrethrin content when exposed to sunlight in an atmosphere of air or of nitrogen. The loss in nitrogen is less rapid than in air and appears to be due to a reaction other than oxidation by free oxygen. The effect of temperature upon the rate of loss of the pyrethrins is shown.

“The rate of loss of the pyrethrins in a methyl alcoholic extract of flowers, when exposed to sunlight and air, was studied. The stabilizing effect of tannic acid and hydroquinone when added to a talc-pyrethrum dust was confirmed. It was shown that such mixtures lose their pyrethrins at a slower rate when exposed in thin layers to air and artificial illumination. Biological trials showed that the addition of these antioxidants did not augment the initial insecticidal activity of the pyrethrins.”

A comparison was made between two samples of pyrethrum flowers, one rich and the other poor in pyrethrins, in order to determine the degree of concordance between the pyrethrin I content and their toxicity. The pyrethrin I value as determined by the acid method, subject to a small correction, gave a good indication of the relative activities of the samples.

Notes on *Neotermes castaneus* Burm., W. L. THOMPSON (*Fla. Ent.*, 18 (1934), No. 3, pp. 33-39, fig. 1).—This contribution from the Florida Experiment Station reports observations on the morphology, biology, and natural enemies of one of the few species of termites that work in growing trees. It has been observed by the author in Polk County only, but has been collected at different points in Dade County and has been found in Mediterranean fruit fly traps in Osceola, Orange, and Seminole Counties. “The host plants observed are citrus trees (including grapefruit, orange, tangerine, and lime), the live oak, and mangrove trees. There are probably many other hosts not listed, as experiments conducted in the laboratory for the past 12 mo. show that these termites are thriving on various kinds of lumber, such as cypress, oak, white pine, and pitch pine.”

The praying mantes are hardy in New York, G. W. HERRICK (*Rural New Yorker*, 94 (1935), No. 5313, p. 47, figs. 4).—It is reported that the European praying mantid *Mantis religiosa*, which first appeared in the vicinity of Rochester, N. Y., some 30 yr. ago, has gradually increased and spread over the central part of the State. Reference is also made to the Chinese mantid, which has spread from the vicinity of Philadelphia, Pa., where it first appeared, and become established on Long Island and about New York City.

Committee on locust control: [Third, fourth, fifth, and sixth reports] ([*Gt. Brit.*] *Econ. Advisory Council, Com. Locust Control Rpts.*, 3 (1930), pp. 16; 4 (1932), pp. 43, pl. 1; 5 (1933), pp. 13; 6 (1934), pp. 55).—The third report, by H. A. Miers et al., deals with the history of the investigation, the locust situation today, views of the governments consulted on the scheme of research outlined in the second interim report of the committee (*E. S. R.*, 62, p. 451), the scheme of investigation recommended, and a summary of conclusions and recommendations.

The fourth report, also by Miers et al., includes a review of the locust situation during the period May 1930 to January 1932, a survey of the investigations conducted on the recommendation of the committee up to the end of 1931, a program of investigations recommended for the period April 1932 to March 1933, a report on the wide measure of cooperation secured, and a summary of conclusions and recommendations. The proposed allocation of funds to be expended on locust investigations in 1932-33, an estimate of losses caused by locusts in different countries during the period 1927-31, international cooperation in antilocus work, and a political map of Africa and western Asia are presented in four appendixes.

In the fifth report, proposals for the use of aircraft against locusts, by G. A. K. Marshall et al., the need for new methods of attacking the desert locust (*Schistocerca gregaria* Forsk.) and the tropical migratory locust (*Locusta migratoria migratorioides* R. & F.) are first reported upon. The plan of work proposed is described and a summary given of the recommendations made. The first stage in the experimental work has been reported upon by King and Ruttledge (E. S. R., 67, p. 429).

The sixth report, by Miers et al., reviews the present locust outbreak in Africa and western Asia and the investigations carried out since 1929 and notes the general program of further investigations.

The locust outbreak in Africa and western Asia, 1925-31, [1932, and 1933], B. P. UVAROV (London: Econ. Advisory Council, Com. Locust Control, 1933, pp. 87, p's. 14; 1933, pp. 74, pls. 11; 1934, pp. 66, pls. 9).—The surveys here presented deal respectively with the locust outbreak in Africa and western Asia in 1925-31, in 1932, and in 1933. Each of the three reports includes a bibliography of the literature on locusts and grasshoppers and their control for the periods covered (25, 12, and 10 pages, respectively). The grasshoppers particularly involved are the desert locust (*Schistocerca gregaria* (Forsk.)), the tropical migratory locust (*Locusta migratoria migratorioides* (Rch. & Fairm.)), and the red locust (*Nomadacris septemfasciata* (Serv.)).

Thrips investigation, IV, V (Jour. Council Sci. and Indus. Res. [Aust.], 7 (1934), No. 4, pp. 234-238, figs. 4; 239-244, fig. 1).—Part 4 of this series (E. S. R., 72, p. 222) gives some observations on the fluctuations in the numbers of *Thrips imaginis* Bagn. in the vicinity of Melbourne during the period 1932 to 1934, by H. G. Andrewartha and H. V. Steele. Part 5, by Andrewartha, considers the effect of soil moisture on the viability of the pupal stages of *T. imaginis*.

A new species and variety of Plesiothrips (Thripidae—Thysanoptera), J. G. WATTS (Fla. Ent., 18 (1934), No. 2, pp. 24-27, figs. 3).—Contributing from the South Carolina Experiment Station, *P. andropogoni*, collected from common broomsedge (*Andropogon* sp.) in Oconee and Pickens Counties, S. C., and *P. andropogoni watsoni*, collected from *A. virginicus* at Gainesville, Fla., are here described as new.

Report on questionnaire on Antestia control, 1933-34, R. H. LE PELLEY (Kenya Dept. Agr. Bul. 5 (1934), pp. 32).—This report deals with the incidence of *Antestia* on coffee in Kenya Colony in 1933 and part of 1934 and a survey of the methods used for its control, compiled from information supplied by planters.

Pyrethrum-extract spraying for the control of Antestia on coffee, with suggestions for routine testing on plantations, R. H. LE PELLEY (Kenya Dept. Agr. Bul. 8 (1934), pp. [3]+13).—Part 1 of this contribution (pp. 1-7) consists of a detailed description of a routine method of determining the more

important differences in the incidence of *Antestia* attack in different parts of a plantation at different times in order to insure that control measures are employed adequately and economically. Part 2 (pp. 8-13) reports upon observations of pyrethrum extract spraying as a plantation measure for the control of *Antestia*.

A big-eyed bug predator of the potato psyllid, G. F. KNOWLTON (*Fla. Ent.*, 18 (1934), No. 3, pp. 40-43, figs. 2).—Contributing from the Utah Experiment Station the author reports upon *Geocoris decoratus* Uhler, known as the "big-eyed bug", generally distributed throughout Utah, which commonly occurs upon potatoes in all parts of that State. It had been observed by the author to feed upon *Paratrioza cockerelli* (Sulc.). It has previously been known to be an important enemy of the beet leaf hopper, and in addition had been observed feeding upon small flies and nymphal false chinch bugs as well as upon several other kinds of small insects.

Experiments in control of the pecan black aphid under orchard conditions, G. F. MOZNETTE (*Southeast. Pecan Growers Assoc. Proc.*, 28 (1934), pp. 55-58, 60, 61).—Control work with *Melanocallis caryaefoliae* Davis during the seasons of 1932 and 1933, reported in detail in tabular form, has shown that it may be controlled effectively and premature defoliation prevented by "adding nicotine sulfate 1:4,000 to summer applications of bordeaux mixture used to control pecan scab and foliage diseases, and, where necessary, following with another spray of summer oil emulsion $\frac{1}{2}$:100 and nicotine sulfate 1:4,000 in the fall. In order to obtain effective control of the pecan black aphid, spraying should not be delayed until the trees are heavily infested but should be done when the aphids are first noticed in small numbers and before any yellowing of the foliage has occurred. Where this insect was controlled throughout the season of 1932, and where no premature defoliation occurred, the trees bloomed much more heavily and set a far better crop of nuts in the spring of 1933 than unsprayed trees, which were severely damaged by the pecan black aphid and were prematurely defoliated."

Two new aphids of the tribe Macrosiphini, A. N. TISSOT (*Fla. Ent.*, 18 (1934), No. 2, pp. 17-23, figs. 21).—In this contribution from the Florida Experiment Station, *Macrosiphum mesosphaeri* collected from *Mesosphaerum pectinatum* and *Tritogenaphis eupatorifoliae* from *Eupatorium incarnatum*, both from Gainesville, Fla., are described as new.

Contributions to a knowledge of the white flies (Aleurodidae) of Egypt, III, H. PRIESNER and M. HOSNY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.*, 145 (1934), pp. 11, pls. 10).—In this third contribution (*E. S. R.*, 72, p. 659) the authors present descriptions of and notes on *Aleurolobus niloticus* n. sp., with a reference to *Encarsia elegans* Masi as its most important parasite; *Dialeurodoides afer* n. sp.; *Aleurotrachelus citri* n. sp.; *A. alhagii* n. sp.; *Siphoninus granati* Pr. & Ho.; and *Dialeurodes (Gigaleurodes) elbaensis* n. sp.

Density of population and sterility of the females in the coccid Lepidosaphes ulmi L., E. SMIRNOV and W. POLEJAEFF (*Jour. Anim. Ecol.*, 3 (1934), No. 1, pp. 29-40, figs. 6).—The authors find that the density of population may be considered as a factor regulating excessive reproduction of oyster-shell scale, overpopulation causing a hindering of further population growth. It is pointed out that this should be considered in the prediction of any future outbreaks of this coccid.

Observations on the trend of scale control problems in various citrus producing areas of the world, L. R. GARDNER (*Jour. Ent. and Zool.*, 26 (1934), No. 3, pp. 29-33).—In this contribution the author reports upon observations of citrus scale control problems made during a 5-yr. visitation of the Union of South Africa, Australia, Palestine, Egypt, and Italy.

Lymantria, R. GOLDSCHMIDT (In *Bibliographia Genetica*. 's Gravenhage (The Hague): Martinus Nijhoff, 1934, vol. 11, pp. 1-186, figs. 75).—This contribution, based upon 25 yr. of combined work in breeding, field collecting, taxonomic, morphological, embryological, cytological, genetical, and physiological analysis, deals particularly with the gypsy moth and briefly with the nun moth *L. monacha* L. It is presented with a bibliography of five pages.

An account of the eastern hemlock looper (*Elopija fiscellaria* Gn.) on balsam fir, E. B. WATSON (*Sci. Agr.*, 14 (1934), No. 12, pp. 669-678, pl. 1, fig. 1; *Fr. abs.*, p. 678).—Outbreaks of the hemlock spanworm in Quebec and Nova Scotia, the general appearance of an outbreak, life history and habits, type of forest affected, the origin of outbreaks, winter killing, loss of increment, secondary insects, and natural and artificial control are considered.

The asparagus caterpillar: Its life history and control, J. W. WILSON (*Florida Sta. Bul.* 271 (1934), pp. 26, figs. 5).—Studies of the biology and natural enemies of and control measures for the beet army worm are reported, the details being presented in seven tables. While this pest has been reported to feed on 18 plants other than *Asparagus plumosus*, in Florida it has rarely been observed outside of ferneries, where it has been found for a number of years, as previously reported (E. S. R., 69, pp. 392, 398). Its injury is caused by the young larvae feeding on the tender buds and the older larvae on the more advanced growth.

"Eggs are laid on the underside of the sprays in masses. These masses are usually covered with scales from the female moth's body. The eggs hatch in 2 to 3 days during the summer. The larvae molt 5 times and require 9 to 15 days (during the summer months) to complete this stage. The mature larvae form a pupal cell a short distance below the soil surface and remain in this cell for 6 to 11 days during the months from May to October. The length of these stages is increased considerably during the winter months."

The parasites *Chelonus texanus* Cress. and *Euplectrus platyhyphenae* How. are of considerable aid in controlling the pest, and the fungus *Spicaria prasina* is instrumental in destroying large numbers of the larvae. The dusting of undiluted arsenate of lead is said to be the best artificial means of control.

The biological control of teak defoliators, C. F. C. BEESON (*Indian Forester*, 60 (1934), No. 10, pp. 672-683).—This contribution relates to the control by parasites and predators of two defoliating caterpillars, *Hyblaea puera* and *Hapalia machaeralis*, which have a sequence of from 13 to 15 generations a year in the south and 8 to 10 in the north of India, and of a group of caterpillars, grasshoppers, and beetles with longer life cycles that are of variable importance locally and seasonally in the defoliation of teak.

Iris-pigment migration and its relation to behavior in the codling moth, D. L. COLLINS (*Jour. Expt. Zool.*, 69 (1934), No. 2, pp. 165-197, figs. 16).—The author finds that "the position of the pigment granules in the eye of the codling moth varies according to the intensity of the light to which the moth is subjected, the iris pigment being more sensitive to light than the reticular pigment. . . . In the presence of very dim light dark-adapted moths may remain completely dark-adapted or may become partially light-adapted. The codling moth appears to be most sensitive to light in the last stages of the dark-adapting pigment migration and during the first hour of complete dark adaptation. The codling moth is positively phototropic to a marked degree only when dark-adapted. The vital activities of the moth are carried on almost exclusively during periods of changing light intensity. These are also the times when the iris pigment is shifting from one position to the other in order to adapt the eye to the fluctuations in the light environment. The nature of the moth's reactions to either constant or changing light varies according to the position

of the iris pigment. The iris pigment migrations are thus a prominent factor in determining the behavior of the moths."

[Contributions on the codling moth in the northwestern United States] (*Better Fruit*, 29 (1935), No. 8, pp. 3-6, 8, 10, 11, 14, 15, 20, 21, 22, figs. 2).—Contributions relating particularly to the codling moth control problem in the Northwest include the following: Codling Moth Control in Washington, by R. L. Webster (pp. 3, 4, 22); Substitutes for Lead Arsenate in Codling Moth Control in the Hood River Valley, by L. Childs (pp. 5, 6); Codling Moth—a National Problem, by E. J. Newcomer (pp. 8, 21); Some Factors Influencing Codling Moth Control, by C. Wakeland (pp. 10, 11, 20), contributed by the Idaho Experiment Station; and Tree Scraping for Moth Control, by O. T. McWhorter (pp. 14, 15).

Penetration and development of the fungus *Beauveria bassiana* in the tissues of the corn borer, C. L. LEFEBVRE (*Ann. Bot. [London]*, 48 (1934), No. 190, pp. 441-452, pl. 1, figs. 2).—The effects of artificial inoculation were studied. The germ tubes were able to penetrate the larval integument at any point except the head, and to penetrate the pupal covering at the thinner places. Infection via the alimentary tract was also indicated. Larvae from Manchuria appeared to carry the fungus internally in a dormant, noninjurious state at temperatures below 14° C., but succumbed rapidly to its attack when placed at room temperature.

The cotton boll borer *Mescinia peruella* Schaus, an important pest of cotton in Peru (Lepidoptera, Pyralidae [trans. title], J. WILLE (*Rev. Ent.*, 4 (1934), No. 4, pp. 455-485, figs. 13; abs. in *Rev. Appl. Ent.*, 23 (1935), Ser. A, No. 1, pp. 16, 17).—A report is made of a study of the occurrence, morphology, biology, including natural enemies, economic importance, and control of the pyralid shoot, square, and boll borer *M. peruella*, the most important enemy of cotton in the coastal valleys of Peru.

Studies of fluctuations in insect populations.—III, The gall midge *Rhabdophaga heterobia* H. Lw. on black maul variety of *Salix triandra* at Syston, Leicestershire, 1927-33, H. F. BARNES (*Jour. Anim. Ecol.*, 3 (1934), No. 2, pp. 165-181, figs. 4).—This third contribution from the Rothamsted Experimental Station of a series of studies on the fluctuations of insect populations in the field (*E. S. R.*, 69, p. 558) deals with the gall midge *R. heterobia*.

A brief guide to the varieties of "*Anopheles maculipennis*", R. CHRISTOPHERS ET AL. (*League Nations Health Organ. Quart. Bul.*, 3 (1934), No. 4, pp. 654-661, figs. 2).—This is a report of the meeting of experts held in Roma, Italy, August 20 to 22, 1934, by the malaria commission of the League of Nations. It is considered clear that *A. maculipennis* consists of a number of recognized varieties, of which, in addition to the type *A. maculipennis* Meig., *A. maculipennis atroparvus* Van Thiel, *A. maculipennis messeae* Flni., *A. maculipennis labbranchiae* Flni., and *A. maculipennis melanoon* Hack. are considered valid. It is pointed out that in addition *A. elutus* Edw. is a closely allied species, or another variety, occurring in the Old World. No consideration has here been given to the American forms.

Malaria and Culicidae in the Philippine Islands: History and critical bibliography, 1898 to 1933, P. F. RUSSELL (*Philippine Dept. Agr. and Com., Tech. Bul.* 1 (1934), pp. 115, pls. 8, figs. 3).—This contribution is accompanied by a bibliography of 39 pages and a synonymic list of the Philippine species of the tribe Anophelini.

Revision of the Syrphus flies of America north of Mexico (Diptera, Syrphidae, *Syrphus* s[ens.] l[at.])—Part I, C. L. FLUKE, JR. (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 28 (1933), pp. 63-127, figs. 44).—In this first part

of the revision of the Syrphidae the author recognizes 12 species of the genus *Syrphus*, of which 1 is described as new, and 40 of the genus *Metasyrphus*, of which 4 are described as new. Keys to the genera of *Syrphus* sens. lat., including *Syrphus*, *Metasyrphus*, *Ischyrosyrphus*, and *Epistrophe*, and to the species of the genus *Syrphus* sens. strict. and of the genus *Metasyrphus* are included.

American muscoid flies of the genera *Ceratomyiella* and *Paradidyma*, H. J. REINHARD (*U. S. Natl. Mus. Proc.*, 83 (1934), No. 2973, pp. 9-43).—This contribution from the Texas Experiment Station consists of a discussion of the generic characters of the tachinid genera *Ceratomyiella* and *Paradidyma*, keys for the separation of the species in both sexes, and descriptions of 24 species, of which 15 are new to science.

Jetting for the reduction of sheep blowfly attack, R. N. McCULLOCH (*Agr. Gaz. N. S. Wales*, 45 (1934), No. 10, pp. 581-585, fig. 1).—It is reported that in 1933-34 a calcium arsenite mixture again (*E. S. R.*, 71 p. 515) gave better protection from blowfly strike than did sodium arsenite. Paris green suspension at an increased concentration in the one test in which it was used gave rather less protection than did calcium arsenite at standard strength in other tests.

"The period during which jetting with calcium arsenite so limited strikes as to afford adequate protection in the absence of hand dressing was considered in the tests carried out by the writer to vary from 4 to 5½ weeks. . . . As a preventive of strike, crutching proved superior to jetting with calcium arsenite in two experiments. Crutching followed by two jettings proved much superior in the reduction of strikes and the prevention of their spread to either three jettings or one crutching alone. The tests here described indicate that crutching, if it were almost to obviate hand dressing, would have to be repeated at intervals of 6 weeks. The conclusion may also be drawn that jetting, which is less expensive, can be used with equal effect after the one crutching midway between shearings."

The rôle of *Lucilia sericata* Meig. larvae in osteomyelitis wounds, M. A. STEWART (*Ann. Trop. Med. and Parasitol.*, 28 (1934), No. 4, pp. 445-460).—This contribution, presented with a list of 23 references to the literature, is a more detailed discussion than that previously noted (*E. S. R.*, 71, p. 841).

Cochliomyia and myiasis in tropical America, D. AUBERTIN and P. A. BUXTON (*Ann. Trop. Med. and Parasitol.*, 28 (1934), No. 3, pp. 245-254, pl. 1).—This contribution dealing with the classification, biology, geographical distribution, and pathology of forms of the genus *Cochliomyia* responsible for myiasis in tropical America, is presented in connection with a list of 26 references to the literature.

Human intestinal myiasis due to the larvae of the soldier fly *Hermetia illucens* Linné (Diptera, Stratiomyidae), H. E. MELENEY and P. D. HARWOOD (*Amer. Jour. Trop. Med.*, 15 (1935), No. 1, pp. 45-49, figs. 2).—This is said to be the second case of human parasitism by the larvae of *H. illucens* to have been reported in the literature.

Studies on the higher Diptera of medical and veterinary importance (*Ann. Trop. Med. and Parasitol.*, 28 (1934), Nos. 2, pp. 205-216, figs. 11, 217-223, figs. 5; 3, pp. 305-314, figs. 8, 315-322, figs. 6; 4, pp. 571-578, figs. 6, 579-588, figs. 7).—The contributions presented (*E. S. R.*, 71, pp. 226, 674) include revisions of the genera of the subfamily Calliphorinae based on a comparative study of the male and female terminalia for (1) the genus *Calliphora* Robineau-Desvoidy (sens. lat.) (pp. 205-216), (2) the genus *Chrysomyia* Robineau-Desvoidy (sens. lat.) (pp. 217-223), and (3) the genus *Phormia* Robineau-Desvoidy (sens. lat.) (pp. 305-314), all by W. S. Patton and E. C. Cushing; A Revision of the Species of the Genus *Glossina* Wiedemann Based on a Comparative Study of

the Male and Female Terminalia, by W. S. Patton (pp. 315-322, 579-588); and A Revision of the Genera of the Tribe Muscini, Subfamily Muscinae, Based on a Comparative Study of the Male Terminalia—III, The Metallic Muscini, by W. S. Patton and E. G. Gibbins (pp. 571-578).

Studies on the Mexican fruit fly, *Anastrepha ludens* (Loew), H. H. DABBY and E. M. KAPP (*U. S. Dept. Agr., Tech. Bul. 444* (1934), pp. 20, figs. 13).—The investigations of the Mexican fruit fly reported, which were conducted in a laboratory in Mexico City in connection with those on the effect of high and low temperatures (*E. S. R.*, 70, p. 214), deal with the H-ion concentration of soil in relation to the pupation, length of life, the toxicity of copper, temperature in relation to host-parasite equilibrium, and humidity in relation to the survival of the larval parasite *Opius crawfordi*.

The studies have shown that the larvae of this fruit fly on leaving the fruit avoid as far as possible an acid soil for pupation, almost all infested districts having had alkaline or nearly neutral soils. "Both males and females have been found fertile after an adult life longer than the host-free period that was established in the Rio Grande Valley. The possible life cycle at 21° C. (70° F.) is estimated to be about 13 mo. The adults are not dependent on the host fruits for food. Copper chloride, copper nitrate, copper sulfate, and copper carbonate are toxic to the adults of *A. ludens*, the toxic action being apparently associated with the destruction of the yeasts and molds that may be a necessary part of their diet. *A. ludens* can develop under a wide range of temperatures, whereas its parasite *O. crawfordi* has a short range of optimum development which limits its effectiveness to favorable climates. The parasite *O. crawfordi* is very decidedly affected by variations in atmospheric humidity. A humidity higher than 50 percent seems necessary for optimum development."

Stem maggot injury among wheat varieties, R. S. DUNHAM (*Jour. Amer. Soc. Agron.*, 26 (1934), No. 11, pp. 978-980).—Reporting from the Minnesota Experiment Station, tables are given which show the average percentages of dead spikes caused by the wheat stem maggot for nine varieties over a period of 4 yr. The data are averages of two random samples of 100 culms each from each of three 0.025-acre plats planted the same day on uniform soil. Dates of heading are also presented in order to study any association of maximum injury with early or late maturity.

The biology and development of *Cryptochaetum grandicorne* (Diptera), an internal parasite of *Guerinia serratulae* (Coccidae), W. H. THORPE (*Quart. Jour. Micros. Sci.* [London], n. ser., 77 (1934), No. 306, pp. 273-304, figs. 30).—This is a report of a study of the morphology and biology of an agromyzid parasite of the coccid *G. serratulae*, probably confined to the Mediterranean region, which is the only species of the genus known to occur in Europe. The contribution includes a list of 16 references to the literature.

Rat and rat-flea survey of Los Angeles Harbor, H. E. TRIMBLE and G. C. SHERRARD (*Pub. Health Rpts.* [U. S.], 50 (1935), No. 3, pp. 74-79, fig. 1).—In a rat-flea survey made in the harbor district of Los Angeles an average of 2.85 fleas per rat was found. The mouse flea *Leptopsylla musculi* was the most prevalent species, with the oriental rat flea averaging slightly less than one per rat. *Ceratophyllus acutus*, whose natural host is the California ground squirrel (*Citellus beecheyi beecheyi*), was found only once on rats.

Measures for the control of *Anomala orientalis* at the Oahu Sugar Company, Ltd., W. WOLTERS (*Hawaii. Planters' Rec.*, 38 (1934), No. 4, pp. 264-278).—Search in the Orient, Java, and the Philippines by F. A. G. Muir in 1913 for natural enemies of the Asiatic beetle, a native of Japan and Chosen (Korea) known to have been introduced before 1908 but first identified in

Hawaii in 1912, led to the discovery in the Philippines in 1915, importation into Hawaii in 1916 and 1917, and establishment of the hymenopterous parasite *Scolia manilae*. This parasite soon brought the Asiatic beetle under control, as shown by the reduced numbers and slow spread of the beetle, until about 1930 when outbreaks were again noted in some fields. Since that time the beetle infestation has spread, causing more and greater damage, and *S. manilae* seems to have lost control of the situation. This has led to efforts to develop practical and economical measures for its control while awaiting the introduction of a parasite more effective than *S. manilae*. Reference is made to the introduction of several additional parasites and predators and to the release and spread of the giant toad *Bufo marinus*, an account of which has been noted (E. S. R., 72, p. 357). A second parasite, *Tiphia segregata*, introduced from the Philippines in 1917, has become established.

Summarizing the results of the work conducted, it is pointed out that the use of soil fumigants (including chloropicrin, carbon disulfide, and paradichlorobenzene), contact insecticides (derris), electricity, and plowing and fallowing have been found to be impractical. Stomach poisons, particularly white arsenic, have been the most successful of the chemical agencies, a technic for the application of white arsenic under various conditions having been developed and employed with satisfactory results.

Notes on *Stethorus punctillum*, a natural enemy of the common red spider [trans. title], G. VANWIJNGAERDEN (*Agricultura [Louvain]*, 37 (1934), No. 4, pp. 296-302, figs. 8).—These notes relate to the lady beetle *S. punctillum* Ws. as an enemy of the common red spider.

The coconut leaf beetle *Brontispa froggatti* var. *selebensis* and its biological control in Celebes [trans. title] R. AWIBOWO (*Landbouw [Buitenzorg]*, 10 (1934), No. 2, pp. 76-92, figs. 9; *Eng. abs.*, p. 92).—This is a report of a study made of the hispid beetle *B. froggatti selebensis*, which is a source of injury to coconut trees in the eastern part of the Dutch East Indies.

A mathematical theory of the growth of populations of the flour beetle (*Tribolium confusum* Duv.).—III, The effect upon the early stages of population growth of changes in the nutritive value, palatability, and density of packing of the flour medium, J. STANLEY (*Canad. Jour. Res.*, 11 (1934), No. 6, pp. 728-732).—In this third contribution (E. S. R., 69, p. 396) "the questions of the nutritive value of the flour and its palatability have been considered mathematically and it is shown that the number of eggs present at a time *T*, between the start of the culture and the time of hatching of the first egg, is decreased when the flour is less nutritious or less palatable, or less tightly packed, and vice versa. It is further shown that the asymptotic value \bar{x} , toward which the egg population moves in the absence of hatching, is similarly affected. The question of the mechanism underlying these effects is discussed."

Coleopterous pests of stored derris in Malaya, N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 14* (1934), pp. [21]+34, pls. 2).—Twelve species of Coleoptera associated with dried roots of *Derris* spp., including the developmental stages, bionomics, and natural enemies of three, namely, *Sinoxylon anale* Lesne, *Xylopsocus capucinus* F., and *Dinoderus minutus* F., are reported upon. A list of 24 references to the literature is included.

The protection of hides and skins from the ravages of the skin beetle, *Dermestes vulpinus*, B. SMIT (*Union So. Africa Dept. Agr., Sci. Bul. 129* (1934), pp. 17, pls. 5, figs. 2).—Following an account of the skin beetle, experi-

ments conducted with a view to determining the preservative properties of salt and arsenic, and the effectiveness of various ways of applying them, are reported upon.

Salt, when thoroughly applied, was found to give excellent protection against beetle attack. The spraying of sun-dried hides on the inside with a 2.5 percent solution of arsenite of soda gave remarkable protection. Dipping, right off the animal, in a 2.5 percent solution proved more effective than spraying, it having protected the hides almost entirely from beetle attack.

A pepper pest new to the United States, J. R. WATSON (*Fla. Ent.*, 18 (1934), No. 2, p. 23).—*Cryptorhynchus cubae* Boh., an enemy of peppers in the Provinces of Pinar del Río and Habana, Cuba, has been discovered to occur in peppers in Dade County, Fla. Reared in cages at the Florida Experiment Station, larvae were found in the entire length of the pepper plants, from the base to and even including the peduncles of the fruit, although, unlike the pepper weevil, none were found in the peppers themselves. The plants received from Dade County were so highly infested as to be rendered commercially worthless. A report was received from the county agent of Dade County that the depredations in some plantations in the southern part of that county were so severe as to discourage the planting of peppers. The observation that the newly emerged adults feed on the outside of the plants, puncturing the petioles of the leaves which promptly wither and drop, suggests a means of control through the application of insecticides.

History and control of the boll weevil in Oklahoma (*Oklahoma Sta. Bul.* 222 (1934), pp. 32, figs. 9).—Accounts of the early history and dissemination of the bollweevil in Oklahoma and its life history in brief, by C. E. Sanborn (pp. 4-10), of control experiments by the college, prepared by E. Hixson (pp. 10-15), control experiments by the U. S. Department of Agriculture, prepared by H. C. Young (pp. 16-22), and control demonstrations in the State, by E. E. Scholl and C. F. Stiles (pp. 23-28), and recommendations for control, by Hixson, Stiles, and Young (pp. 29-32), are presented.

The recommendations for bollweevil control include the destruction of crop refuse, selection of fields for cotton that are well removed from winter quarters of the weevil, early planting on fertile soil of early-maturing varieties, early cultivation, determination of weevil infestation by square examination, and, if necessary, application of calcium arsenate dust with suitable dusting machinery.

The sugarcane weevil borer *Anacetrinus saccharidis* Barber (Coleopt., Curcul.): Its outbreak and other insect pests in Peru in 1930-31 [trans. title], J. WILLE (*Tropenpflanzer*, 37 (1934), Nos. 5, pp. 185-198, figs. 10; 6, pp. 233-252, figs. 9; abs. in *Rev. Appl. Ent.*, 22 (1934), Ser. A, No. 9, pp. 474, 475).—This contribution reports upon the morphology and biology of *A. saccharidis*, described by Barber in 1927 (*E. S. R.*, 58, p. 460), which first attracted attention in 1931, and also upon the occurrence of several other pests in Peru from 1930 to 1931.

The curculionid cotton pruner *Chalcodermus bondari* Marsh., an enemy of cotton new to the Argentine Republic [trans. title], A. A. OGLOBLIN (*Bol. Min. Agr. [Argentina]*, 36 (1934), No. 2, pp. 121-136, pls. 4, fig. 1).—An account is given of the life history and habits, distribution, food plants, natural enemies, nature and extent of damage, and the means of combating *C. bondari*, described by G. A. K. Marshall in March 1927 from Bahia, Brazil,¹ and first reported upon by G. Bondar, State entomologist of Bahia.² It was first observed in the Argentin-

¹ *Bul. Ent. Res.*, 17 (1927), No. 3, p. 215, 216.

² *Chacaras e Quintaes*, 36 (1927), No. 2, pp. 177-179, figs. 2.

tine Republic in 1931 in El Chaco Territory, where it has been a source of injury to the cotton plant, the oviposition of the adults in the fruiting branches resulting in the withering and loss of the fruit buds.

Prove Dutch elm disease carried by bark beetles (*Jour. Forestry*, 33 (1935), No. 1, pp. 82, 83).—Brief reference is made to the finding by W. Middleton and his associates that individuals of the smaller European elm bark beetle (*Scolytus multistriatus*) from infected elms are contaminated with the fungus of Dutch elm disease (*Ceratostomella (Graphium) ulmi*) and transmit it when feeding in the crotches of healthy trees.

Brood diseases of bees, E. J. RUSSELL ET AL. ([*Rothamsted Expt. Sta., Harpenden*], *Rothamsted Confs. No. 18* [1934], pp. 46, figs. 2).—Following a brief introduction by E. J. Russell (pp. 5–7) to this report of a conference held at Rothamsted on May 19, 1934, of which he was chairman, the distribution of foul brood in England (pp. 8–16), contributed by D. Morland; brood diseases in Scotland, by J. Anderson (pp. 17, 18); history of our knowledge of brood diseases, by A. D. Betts (pp. 19–22); bee disease legislation in other countries, by L. Illingworth (pp. 23–26); recent work on foul brood of the honeybee, by C. H. Chalmers (pp. 27–31); remarks on bee disease investigations at Leeds, by W. Hamilton (p. 32); the present position of the scientific investigation of foul brood diseases of bees, by H. L. A. Tarr (pp. 33–38); and brood diseases of bees, by D. Morland (pp. 41–46), are presented.

Biennial report of the [Nevada] State Apiary Commission for the period July 1, 1932, to June 30, 1934, inclusive (*Nev. State Apiary Comn. Bien. Rpt.*, 1933–34, pp. 6).—This is a brief report for the biennium ended June 30, 1934.

Experiments in simplified control of mound-building ants in the forest, H. J. MACALONEY and N. W. HOSLEY (*Jour. Forestry*, 32 (1934), No. 9, pp. 1003–1006).—Experiments extending over a period of 3 yr. have shown that carbon disulfide or ethylene dichloride, if properly used, will control the mound-building ant (*Formica exsectoides* Forel). The quantity of carbon disulfide or ethylene dichloride to be used will be governed primarily by the size of the mound. A dosage of 1 lb. (approximately 1 pt.) will be sufficient for a small mound, less than 18 in. in diameter. For a medium-sized mound, less than 2.5 ft. in diameter, 2 lb. should be used. A large mound may need two or more applications of 2 lb. each. Fumigation late in the fall, after seasonal activity has ceased, or early in the spring, before it has been resumed, will be most successful because all the ants are then present in the mound.

Paradichlorobenzene and granular calcium cyanide were not effective when placed in drilled holes and then tamped. A lighter-than-air gas, in order to be effective, must kill the ants quickly.

The biology of *Cremastus flavoorbitalis* (Cameron), an ichneumonid parasite of the European corn borer, W. G. BRADLEY and E. D. BURGESS (*U. S. Dept. Agr., Tech. Bul. 441* (1934), pp. 16, pls. 2, figs. 8).—This contribution relates to *C. flavoorbitalis*, previously known as *C. hymeniae*, a larval parasite of the European corn borer introduced from the Orient in the winter of 1928–29 and liberated during the summer of 1929. More recently it has been liberated in Pennsylvania to combat the oriental fruit moth. The parasite is found quite generally in the Hawaiian Islands, where it has a large number of hosts and is instrumental in the control of the coconut leaf roller and the sugarcane leaf roller. It has been liberated in the three southern States of New England, New York, Ohio, and Ontario, and has been recovered from the greater Boston area in Massachusetts, from Providence, R. I., and from Lucas County, Ohio.

Its egg, which is laid in the body of the host larva and floats freely within its walls, hatches in 3.5 days. The larva after passing through three instars in 5, 1, and 2 days, respectively, emerges through a hole in the middle of the host and pupates. It remains in the cocoon for 10 days, during the first 3 of which it is in the prepupal stage.

A list is given of 12 references to the literature.

Notes on hymenopterous parasites of padi pests in Malaya, H. T. PAGDEN (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 15 (1934)*, pp. [2]+[13], pls. 4).—The notes here presented were made during the years 1929-32 in the course of experimental work connected with the control of lepidopterous stem borers of rice by means of mass production of *Trichogramma japonica* Ashm.

New Ichneumonidae from India and China, R. A. CUSHMAN (*Indian Forest Rec., 20 (1934), No. 12, pp. 8, fig. 1*).—The genera *Monomacrodon* and *Anomaloctenus* are erected, and six species, representing these and the genera *Microtoridea*, *Pristomerus*, *Cremastus*, and *Mesochorus*, five of which were reared at Dehra Dun, India, from insect pests of teak and lac, are described as new.

Insect pests of citrus-trees in Formosa, I, II, T. SHIRAKI (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 6 (1934), Nos. 1, pp. 29-36; 2, pp. 187-194*).—In this contribution from the Government Research Institute at Taiwan (Formosa), a brief note is presented on each species attacking the orange, chiefly summarized from several observations and experiments in the field or laboratory. It is said that up to the present time about 130 species have been observed, only a few of which have been given adequate study.

Control of the northern fowl mite, W. E. WHITEHEAD and W. A. MAW (*Sci. Agr., 15 (1934), No. 2, p. 126; Fr. abs.*).—In control work with *Liponyssus silviarum* C. & F., a mixture of naphthalene flakes 1 part and vaseline 2 parts gave 100 percent control on birds and on perches. Dichloricid and vaseline, in the same proportion, also gave satisfactory results. Comparative tests in the laboratory indicate that Black Leaf 40 used on perches has a slower action than either that of naphthalene or dichloricid, and its cost is considerable.

It is pointed out that naphthalene and vaseline have also been used against the chicken body louse with good results. It should, however, be applied to various parts of the body since naphthalene fumes are not as lethal to lice as to mites.

A mite disease of tomato, tobacco, potato, and other plants in the Philippines, T. G. FAJARDO and G. C. BELLOSILLO (*Philippine Jour. Sci., 54 (1934), No. 4, pp. 523-543, pls. 8*).—A mite, thought to be *Tarsonemus translucens* Green described from Ceylon and India, has been found to be responsible in the greenhouse for the top crinkle or necrosis disease of tomato and other economic plants in the Philippines, being here reported for the first time in those islands. The mite is said to be a serious enemy of potato, chili (*Capiscum* spp.), and other plants in Hawaii, India, and New York. Fumigation with HCN has given satisfactory control.

A study of the ticks in Kenya Colony: The influence of natural conditions and other factors on their distribution and the incidence of tick-borne diseases.—Part III, Investigations into the tick problem in the Masai Reserve, E. A. LEWIS (*Kenya Dept. Agr. Bul. 7 (1934), pp. 65, figs. 2*).—The third part of this study (E. S. R., 68, p. 795) reports on investigations into the tick problem in the Masai Reserve, inhabited by a pastoral and nomadic people.

The part played by alternative hosts in maintaining the tick population of hill pastures, J. MACLEOD (*Jour. Anim. Ecol., 3 (1934), No. 2, pp. 161-164*,

fig. 1).—The author's studies indicate that the removal of sheep, the chief host of the castor-bean tick, from a particular area for a number of years would not effect the eradication of this tick from such an area.

Further attempts to transmit exanthematous typhus of São Paulo by ticks (*Boophilus microplus* and *Amblyomma cajennense*) [trans. title]. J. LEMOS MONTEIRO and F. DA FONSECA (*Compt. Rend. Soc. Biol. [Paris]*, 112 (1933), No. 4, pp. 397-400).—The authors' experiments show that the virus of exanthematous typhus of São Paulo may survive in the body of *B. microplus* (Can.) for several days; that it may survive in the body of *A. cajennense* (Fab.) and be transmitted upon attachment to the guinea pig. The possibility of hereditary transmission of the virus by *A. cajennense* was demonstrated, confirming the results of earlier work.³ The authors detected the presence of *Rickettsia brasiliensis* Mont., previously described by the senior author⁴ as the causal agent of the affection, in sections of infected ticks (*A. cajennense*).

The repellent and killing effects of gordura grass on the larvae of the cattle tick *Boophilus australis*, Z. DE JESUS (*Philippine Jour. Anim. Indus.*, 1 (1934), No. 4, pp. 193-207, pls. 2, figs. 2).—This is a report of a study by the author of which an earlier reference has been noted (E. S. R., 71, p. 536).

ANIMAL PRODUCTION

Emergency livestock feeding (*Missouri Sta. Circ.* 182 (1934), pp. 4, fig. 1).—Rations are suggested for feeding the various classes of farm livestock with the feeds available due to conditions following the drought, together with comments on feeds that must be purchased.

Herring meal—chemical composition, nutritive value, and use [trans. title], H. ISAACHSEN (*Meld. Norges Landbr. Høiskole.*, 14 (1934), No. 2-3, pp. 249-274).—In this report from the Royal Agricultural College of Norway the history of the use of herring meal; the methods of production; the protein, mineral, and vitamin content of the meal, its feeding value, and its uses in feeding livestock are discussed.

[Livestock studies in Arkansas] (*Arkansas Sta. Bul.* 312 (1934), pp. 28-31, 32, 33).—Tests with swine produced results on the feeding value of rice polish mixtures and their effect on the quality of pork produced; soybean, cowpea, Sudan grass, and sweet sorghum pastures for growing and fattening swine; rape compared with turnip pasture with corn, tankage, and minerals for swine; and Sudan grass compared with sweet sorghum, with and without tankage, for fattening swine, all by E. Martin.

Poultry studies yielded information on the value of rice byproducts in the laying ration, and influence of certain factors upon the keeping qualities of eggs in cold storage, both by R. M. Smith.

[Livestock investigations in Colorado] (*Colorado Sta. Rpt.* 1934, pp. 10, 11).—Results obtained in studies with livestock are reported on mineral supplements to beet byproduct rations for cattle fattening, wintering beef calves, and mineral supplements and grinding cane fodder in lamb fattening rations.

[Livestock investigations in Iowa] (*Iowa Sta. Rpt.* 1934, pp. 49-51, 52-55, 56-59, 61, 62).—Data obtained in tests with beef cattle are reported on protein supplements and a simple mineral mixture for fattening calves, and finishing

³ J. Lemos Monteiro, F. da Fonseca, and A. Prado. *Brasil Med.*, 46 (1932), No. 3, pp. 49-52.

⁴ *Brasil Med.*, 45 (1931), No. 35, pp. 805-807, fig. 1, Eng. abs. pp. 806, 807; also in *Compt. Rend. Soc. Biol. [Paris]*, 108 (1931), No. 30, pp. 521-524, fig. 1. *Brasil Med.*, 46 (1932), No. 17, pp. 385-390. *Compt. Rend. Soc. Biol. [Paris]*, 110 (1932), No. 24, pp. 858-860.

steers on bluegrass pasture, both by C. C. Culbertson; and the influence of sex upon the quality and palatability of beef from calves and yearlings, by M. D. Helser, F. J. Beard, Culbertson, B. H. Thomas, and P. M. Nelson.

Swine studies yielded information on the postuterine curves of hemoglobin for pigs, by Thomas; the relative efficiency of different sources of calcium for growing and fattening spring pigs in dry lot, by Culbertson and Thomas; swine performance record, and the influence of soybeans and soybean products upon the character and quality of fat and lard from swine, both by Culbertson, Helser, Beard, and Thomas; and the relative efficiency of different types of corn for growing and fattening pigs, by Culbertson and J. L. Robinson.

Nutrition investigations yielded data on the development and cure of nutritional anemia in lambs, by Thomas; and the depression of intestinal reduction of vitamin D and the nature of the floridin activation of cholesterol, both by L. Yoder.

Poultry studies gave results on the effect of diet on the quantity of vitamins A and D occurring in hens' eggs, by Thomas; biological value of meat scrap and milk combinations for egg production, and egg yolk and chicken fat as preventives of rickets and slipped tendons of chicks, both by E. W. Henderson; influence of selection and breeding upon egg production and maturity, by N. F. Waters; the influence of protein levels and calcium and phosphorus balance upon rachitis of chicks, by H. L. Wilcke and Henderson.

[**Livestock investigations in Nebraska**] (*Nebraska Sta. Rpt.* [1933], pp. 18-22, 27, 28, 32, 35, 36, 37).—Results of cattle studies are reported on wintering rations for stock calves, temporary pastures, the effect of corn in various forms on rate and economy of gain, feeding cattle on native grass at the North Platte Substation, and wintering range calves at the Valentine Substation.

Hog tests yielded information on rations for fattening pigs on Sudan grass, the effect of method of preparation on the feeding value of barley for pigs, forage crops for hogs, and a comparison of grains for fattening pigs at the North Platte Substation.

With sheep results were obtained on linseed meal, cottonseed meal, and corn gluten meal as supplements to corn and alfalfa in fattening lambs; production of market lambs from aged western ewes; and feeding wheat to lambs at the Scotts Bluff Substation.

Poultry investigations produced data on the feeding value of various dried meat products, the antirachitic value of cod-liver stearin for growing chicks, nutritive value of wheat and wheat milling products for growing chicks, modifying the calcium-phosphorus ratio of a specific ration for poults, effect of humidity on the hatchability of turkey eggs, the comparative efficiency of various proteins in poultry feeding, and the effect of season on fertility and hatchability of turkey eggs at the Valentine Substation.

[**Livestock investigations by the Cornell Station**] ([*New York*] *Cornell Sta. Rpt.* 1934, pp. 70-72, 73, 74, 75-78, 117-121).—Nutrition investigations yielded data on extending the life span by dietary means, by C. M. McCay, L. A. Maynard, et al.; synthetic diets for Herbivora, by McCay, Maynard, et al.; insects (cockroach) as test animals in nutrition studies, by McCay, Maynard, R. M. Melampy, and M. F. Crowell; and nutritional requirements of trout, by McCay and A. V. Tunison.

Studies with swine and beef cattle gave results on a comparison of tankage, menhaden fish meal, and whitefish meal as protein supplements in rations for growing and fattening pigs, by F. B. Morrison and J. P. Willman; limited feeding as compared with full feeding for growing and fattening pigs in dry lot, by Willman, Morrison, and M. St. Pierre; and protein requirements of yearling steers, by R. B. Hinman, Morrison, and J. I. Miller.

Tests with sheep produced information on the nutritive value of proteins of feeds for ruminants, by Morrison, K. L. Turk, and Maynard; rations for fattening lambs, by Morrison and Willman; the relation of feeding and management to the "stiff lamb" disease, by Willman, Morrison, S. A. Asdell, and P. Olafson; and temporary pasture crops for lambs, by Willman.

Data from poultry tests are reported on a physiological, physical, and chemical study of high- and low-hatching lines of Single Comb White Leghorns, by G. O. Hall and J. J. Bronkhorst; the relationships between head type and annual production, average annual egg weight, and average annual laying load, by Hall and L. C. Clevenger; the use of the electric canopy hover in warm- and cold-room brooding, by F. L. Fairbanks and L. N. Gilmore; biological studies of the problems of artificial incubation, by A. L. Romanoff; the relative vitamin G content of common protein supplements used in poultry rations, by H. S. Wilgus, Jr., L. C. Norris, and G. F. Heuser; nutritive requirements of turkeys, by Heuser; evidence that lactochrome is one factor of the vitamin G complex, by V. Helman, R. A. Sullivan, and Norris; the effect of process of manufacture upon the vitamin G content of dried skim milk, by H. J. Davis and Norris; the value of corn gluten meal for poultry feeding, by R. C. Ringrose and Norris; and the complex nature of vitamin G, by A. T. Ringrose and Norris.

[**Livestock investigations in Pennsylvania**] (*Pennsylvania Sta. Bul. 308* (1934), pp. 12-15, 20-22, figs. 2).—Data obtained in tests with livestock are reported on hothouse lamb production, and effect of shearing on finish of lambs, both by W. L. Henning, T. B. Keith, P. T. Ziegler, and P. C. MacKenzie; grinding grain for pigs, by M. A. McCarty and J. E. Nicholas; relation of feeder grade to gains of steers, by F. L. Bentley, Ziegler, and MacKenzie; and curing hams, by Ziegler, R. C. Miller, and H. O. Triebold.

Nutrition studies yielded data on minerals in feeds, by E. B. Forbes et al.; nutrient deficiencies, by W. W. Braman, R. W. Swift, F. J. McClure, O. J. Kahlenberg, A. Black, L. Voris, and Forbes; dynamic effect of nutrients, and heat production of the albino rat, both by M. Kriss, Forbes, and Miller.

Information resulting from poultry tests is given on poultry feeding, by J. E. Hunter and H. C. Knandel; hen batteries, by E. W. Callenbach and Knandel; poultry breeding, by Callenbach; and brooding chicks, by Callenbach and Nicholas.

[**Investigations with livestock in South Carolina**] (*South Carolina Sta. Rpt. 1934*, pp. 31, 32, 77-81, 85, 86).—Beef cattle studies yielded information on methods of feeding cottonseed meal and hulls to fattening steers, by L. V. Starkey and E. G. Godbey; reducing the cost of wintering purebred beef cows by using a reserved permanent pasture, by Starkey; and the effect of phosphorus and calcium on the growth and breeding qualities of beef cattle at the Coast Substation, by T. M. Clyburn and E. D. Kyzer.

Swine studies gave results on a comparison of green rye and barley as forages for fattening hogs, and rations for fattening hogs on green barley, both by Godbey; and winter forage crops for fattening hogs at the Coast Substation, by Kyzer and Clyburn.

Poultry investigations resulted in data on the use of vegetable proteins in laying and breeding rations, by C. L. Morgan; and complex v. simple laying mash, laying mash formulas, chick-starting rations, and poultry-housing experiments, all by Morgan and D. F. Sowell.

Growth and development with special reference to domestic animals.—XXXIV, Basal metabolism, endogenous nitrogen, creatinine, and neutral sulphur excretions as functions of body weight, S. BRODY, R. C. PROCTER, and U. S. ASHWORTH (*Missouri Sta. Res. Bul. 220* (1934), pp. 40, figs. 7).—Continuing this series of investigations (E. S. R., 72, p. 85), an analysis was

made of a large body of basal metabolism data of mature animals of different species ranging in weight from 0.02 to 4,000 kg. This analysis showed that the basal metabolism tended to vary with the 0.73 power of body weight, and from this information the general equation was produced $Q=70.5 M^{0.734}$, in which Q is basal metabolism in kilocalories per day for body weight, M , in kilograms.

An analysis of a smaller body of data on minimum urinary nitrogen excretion by mature animals ranging in weight from 0.02 to 500 kg showed that this factor varied with the 0.72 power of body weight. The equation prepared for this factor was $N=146 M^{0.72}$, in which N is milligrams per day of endogenous urinary nitrogen excretion for body weight, M .

An analysis of a relatively small body of data on neutral sulfur excretion of mature animals ranging in weight from 0.1 to 800 kg showed that this factor tended to vary with the 0.74 power of body weight, and resulted in the equation $NS=6.85 M^{0.74}$, in which NS is milligrams per day of neutral sulfur for body weight, M .

The differences in the numerical values of the exponents of the above equations were within the limits of experimental error, therefore within these limits basal metabolism, endogenous nitrogen, and neutral sulfur excretion all increase or tend to increase in the same proportion with increasing body weight of mature animals of different species.

The creatinine excretion of animals of the same species tended to vary directly with body weight, but in mature animals of different species this factor varied with the 0.9 power of weight. Creatinine nitrogen was not, therefore, a directly proportional index of either endogenous nitrogen or of basal metabolism of mature animals.

Prediction tables are given for basal metabolism, endogenous nitrogen, creatinine nitrogen, neutral sulfur, protein equivalents of endogenous nitrogen, calories in the form of protein of endogenous nitrogen, and the ratios between these variables. Maintenance feeding standards are suggested on the basis of the equation $Y=AM^{0.73}$, in which Y is digestible feed requirement for maintaining body weight M .

The methods of securing the data and their sources are given in the appendix.

Effect of inorganic salt intake upon the mineral composition of the blood. V. G. HELLER and H. PAUL (*Jour. Biol. Chem.*, 105 (1934), No. 4, pp. 655-661).—Continuing this study (E. S. R., 70, p. 816) at the Oklahoma Experiment Station, mineral analyses were made of the serum and cells of the blood of animals drinking saline solutions.

Only small changes occurred in the sodium, potassium, calcium, magnesium, and chloride content of either the plasma or cells of the blood under all conditions approaching normal. The sulfate content appeared to be more easily altered. When greater concentrations of salt were consumed there was always some increase in the inorganic content of the blood, but marked changes took place only as death approached. It was felt that in all probability the changes in blood condition were responsible for death. Measurements of the lowering of the freezing point of the serum of these animals showed that some increase in the salt content of the blood always followed the consumption of saline waters. This change was small but significant, and increased with the quantity of salt ingested.

The influence of chronic fluorosis upon vitamin C in certain organs of the rat. P. H. PHILLIPS and C. Y. CHANG (*Jour. Biol. Chem.*, 105 (1934), No. 2, pp. 405-410, fig. 1).—The results of this study at the Wisconsin Experiment

Station confirmed previous evidence that sodium fluoride in sufficient quantities inhibited growth. Fluorine toxicosis had no influence on the vitamin C content of the liver or kidney in the rat, but did cause an increase in the vitamin C potency of the anterior lobe of the hypophysis and the suprarenal gland, irrespective of the ration fed. The vitamin C content of the suprarenal gland of the sodium fluoride fed rats per 100 g of body weight was approximately twice that of the control animals. The weight of the gland in these rats also increased, but only to the extent of 20 to 40 percent, which seemed to indicate a definite increase in the vitamin C concentration of the gland.

The prevention of goiter in farm animals, H. WELCH (*Montana Sta. Circ. 145* (1934), pp. 6, figs. 4).—The feeding of iodine to livestock for the prevention of goiter is discussed.

[Pasture investigations in Georgia] (*Georgia Coastal Plain Sta. Bul. 24* (1934), pp. 48–55, figs. 3).—Data obtained in cooperation with the U. S. Department of Agriculture in pasture studies with cattle are reported on lowland permanent pastures in southern Georgia; upland permanent pastures; and temporary pastures of kudzu, oats followed by common lespedeza, Austrian winter peas, hairy vetch; and oats followed by Sudan grass, and Abruzzi rye followed by soybeans.

Fattening Idaho range cattle, C. W. HICKMAN, E. F. RINEHART, and R. F. JOHNSON (*Idaho Sta. Bul. 209* (1934), pp. 72, figs. 12).—The results of experiments are reported, many of which have been previously noted (*E. S. R.*, 63, p. 556; 66, p. 256), at the Caldwell Substation covering a period of 15 yr.

Alfalfa hay formed the basis for cattle-fattening rations in Idaho. With good quality hay, chopping or grinding increased the consumption and the gains, but with hay of poor quality containing coarse, woody stems and unpalatable weeds, processing the hay had the opposite effect. When hay alone was fed, 2,450 lb. of long hay, 2,142 lb. of chopped hay, and 1,993 lb. of ground hay were required to produce 100 lb. of gain on 2-year-old steers. In combination with other feeds, principally silage and grain, chopped hay was more economical than long hay from the standpoint of feed cost and gains. The percentage of long hay wasted increased with the amount of silage and grain added.

There was no significant difference in the feeding value of barley, corn, and wheat, but when fed with alfalfa hay, barley or wheat sometimes caused bloat-ing. For 2-year-olds each ton of grain fed replaced 4,160 lb. of hay, and when the increased value of grain-fed cattle was considered each ton of grain had a value equal to 6,260 lb. of hay.

Corn silage had the least value when fed in limited amounts with alfalfa hay and the greatest value as a supplement to a hay and grain ration. It was more valuable as an addition to the ration of yearlings than to that of 2-year-olds. Potatoes at the rate of 17 lb. per head daily were equal in feeding value to corn silage. Cull beans when fed as 15 percent of the grain ration had considerable value, but when fed in larger amounts caused digestive disturbances. Cottonseed meal and linseed meal, while slightly improving the gains and finish, were not profitable when fed with comparatively low-priced feeds.

When surplus feeds consisted mostly of roughages, 2- or 3-year-old steers and cows made the most economical use of the feed, but when roughage was limited and grain plentiful, yearlings or calves were the most profitable. It required from 60 to 120 days to finish 2-year-old steers, 120 to 150 days for yearlings, and 180 to 250 days for calves. On the same ration calves made a

unit of gain on 31 percent less hay and 13 percent less grain than yearlings, while yearlings required 38 percent less hay, 14 percent less silage, but 6 percent more grain than 2-year-olds.

Machine-dried soybean hay for fattening cattle, M. G. SNELL (*Louisiana Sta. Bul.* 257 (1934), pp. 18).—Metabolism trials were conducted with beef steers and beef calves to compare the nutritive value of machine-dried and field-cured soybean hay. The hays were also fed to similar cattle fattening in dry lot and under comparable conditions. The Biloxi variety of soybeans was used.

The results of the metabolism trials showed that machine drying apparently increased the protein, ether extract, and nitrogen-free extract, but decreased the crude fiber and ash content of soybean hay. The digestibility of the protein of machine-dried hay varied little between years, while that of field-cured hay varied widely. The nutritive value of the protein of machine-dried hay was slightly lower than that of field-cured hay. Machine drying apparently did not affect the digestibility or nutritive value of the ether extract, nitrogen-free extract, or ash, but did reduce the digestibility of the crude fiber.

Machine-dried hay produced faster and from 10 to 11 percent more gains on beef steers and calves than did field-cured hay. At the prices charged the machine-dried hay was worth from 59 to 71 percent more than field-cured hay. Cutting or chopping soybean hay saved approximately 40 percent. Calves fed long hay ate or wasted about 47 percent more hay than those getting chopped hay. Machine-dried hay was more palatable than field-cured hay.

Mineral assimilation from two typical fodders, A. VISWANATHA IYER and N. KRISHNA AYYAR (*Indian Jour. Vet. Sci. and Anim. Husb.*, 4 (1934), No. 2, pp. 108-113).—Nutrition studies with bullocks by the animal nutrition section, Bangalore, indicated that the assimilation of lime was dependent to a considerable extent upon the intake. There was also evidence that phosphoric acid materially influenced lime assimilation. A ration low in lime could induce lime assimilation when phosphoric acid was present in sufficient amounts. Adding green grass to the ration increased lime assimilation, part of which was due to the extra lime ingested, but there was a suggestion of an additional vitamin effect.

It was found that jowar hay, although low in lime content, induced assimilation of lime and phosphoric acid. Rice straw, on the other hand, gave negative lime balances that were not corrected by mineral supplements. There were indications that lime was not readily assimilated from the type of straw used.

[Studies with sheep at the Belle Fourche (S. Dak.) Field Station], B. AUNE, L. A. HURST, and A. OSENBURG (*U. S. Dept. Agr., Tech. Bul.* 454 (1934), pp. 21-23).—The results of two tests are briefly noted.

Pasturing alfalfa, corn, and beet tops with sheep (pp. 21-23).—Continuing this study (*E. S. R.*, 57, p. 565), the average daily gain for the 17-yr. period was 0.4 lb. per lamb. On alfalfa averaging 4 tons of hay per acre, the average gain of lambs was 398 lb. per acre.

The average total gain of lambs harvesting corn was 663 lb. per acre when supplemented with 1 acre of beet tops and alfalfa hay in racks. The average daily gain per lamb was 0.3 lb., and it required on the average 4.3 lb. of corn and 9.2 lb. of alfalfa to make 1 lb. of gain.

Pasturing sweetclover with sheep (p. 23).—In this test sweetclover was pastured in the fall of the first year and all of the second year. The spring-seeded clover furnished pasture for 8 ewes for about 40 days. Lambs were pastured on the second-year growth until about August 1. During an average

69-day pasturing period lambs made average daily gains of 0.3 lb. per head, and the gain per acre averaged 259 lb.

The value of sugar beet products in fattening lambs, E. J. MAYNARD (*Natl. Wool Grower*, 25 (1935), No. 1, pp. 25, 26, fig. 1).—In this test at the Utah Experiment Station 4 lots of 50 lambs each, averaging 71 lb. initial weight, were fed for 95 days on a basal ration of barley, alfalfa hay, and salt. Lot 1 received the basal ration only; lot 2 was fed 0.5 lb. of beet molasses in addition; lot 3, 0.75 lb. of dried molasses beet pulp; and lot 4, 0.5 lb. of pellets (compressed beet pulp, molasses, and bone meal). The average daily gains in the respective lots were 0.25, 0.27, 0.3, and 0.29 lb. per head.

The cost of 100 lb. gain was lowest in lot 3, followed in ascending order by lots 4, 2, and 1. The percentage of finished lambs in the respective lots at the end of the feeding period was 51, 71, 56, and 79. The highest net return per lamb was made in lot 4, followed in descending order by lots 3, 2, and 1.

[**Experiments with swine at the Belle Fourche (S. Dak.) Field Station**], B. AUNE, L. A. HURST, and A. OSENBRUG (*U. S. Dept. Agr., Tech. Bul.* 454 (1934), pp. 19–21, 38–42, fig. 1).—The results of hog feeding tests are briefly noted.

Pasturing alfalfa with hogs (pp. 19, 20).—Continuing this work (E. S. R., 57, p. 566), the table has been enlarged to bring the results up to and including 1932.

The average pasturing periods for the two rotations for 20 and 18 yr. were 118 and 119 days, respectively. The average live weight pastured per acre was 2,234 and 2,273 lb., and the average gains 1,844 and 1,880 lb. It required 2.9 and 2.8 lb. of grain per pound of gain in the respective rotations.

Pasturing corn with hogs (pp. 20, 21).—The results of harvesting corn in the above rotations gave the following results: The average length of the tests was 25 days, the average initial weight 91 lb. per pig, and the average daily gain 1.7 lb. requiring 4.2 lb. of corn per pound of gain. The average yield of corn for the period was 50.6 bu. per acre, producing 694 lb. of pork.

Feeding experiments with hogs (pp. 38, 39).—In cooperation with the South Dakota Experiment Station tests were conducted over a 5-yr. period on crop utilization with hogs, including pasturing tests of alfalfa and methods of producing fat market hogs. Tables are given showing the feed requirements of spring and fall pigs during the gestation and suckling periods. The dams and their litters were self-fed ground feeds. The average gain per sow for the 5-yr. period was 69 lb. for fall pigs and 65 lb. for spring pigs. There was practically no difference in the feed required per weaned pig.

Feeding experiments with fall pigs (pp. 39–42).—At weaning time the fall pigs in the above-described test were divided into two lots, one of which was self-fed shelled corn until they reached market weight. The other lot was fed 1.5 lb. of corn until turned on pasture about May 20, then a 2 percent ration of corn to about July 10, and then self-fed on alfalfa pasture until they reached market weight. During the winter alfalfa hay was fed to both lots. The 5-yr. average feed requirement per 100 lb. of gain in the limited-fed lot was 340 lb. of corn, 179 lb. of alfalfa hay, and 75 days on alfalfa pasture, while in the self-fed lot the requirement was 398 lb. of corn and 156 lb. of alfalfa hay. The limited-fed lot required 248 days and the self-fed lot 170 days from weaning to market weight. The average selling price was 40 ct. per hundred-weight higher in the self-fed lot.

Liberal v. limited rations for draft colts in Michigan, R. S. HUDSON (*Michigan Sta. Spec. Bul.* 253 (1934), pp. 20, figs. 8).—Weanling colts were divided into 3 lots of 8 head each to determine the effect on development and

value of the colts fed liberal, conservative, and limited rations. Each lot was provided with an open shelter and a paddock of 4.4 acres. During the 2 winter feeding periods lot 1 was fed all the hay and grain (equal parts of whole oats and ear corn) they would consume. Lot 2 received one-half as much grain and 1.1 lb. of hay per 100 lb. of live weight, while lot 3 received one-fourth as much grain as lot 1 and slightly less hay than lot 2. Straw and salt were available to all lots, but lot 1 refused to eat straw and its feeding was discontinued in this lot. During the 2 pasture seasons all dry feed and grain were discontinued, except the grain in lot 1. Because of a shortage of pasture it was necessary to do some feeding during the latter part of both grazing seasons. Weights and measurements were taken at regular intervals during the test.

This test revealed that colts fed limited winter rations made more rapid gains on pasture than colts more liberally fed, but not enough to offset the smaller gains made during the winter months. The limited ration of grain and alfalfa hay did not stunt the growth of colts, but did retard development. The limited ration appeared to have a greater effect on weight and condition than on skeletal development.

The author includes recommendations on the care and management of colts during this developmental period.

Dog-feeding suggestions, W. D. SALMON (*Alabama Sta. Leaflet 13* (1935), pp. 3).—In this leaflet the author discusses the points to be considered in feeding dogs. Suggestions are given on rations—how to feed, amount and frequency of feeding, and palatability and completeness of ration.

Weight loss and chemical composition of rabbit carcasses, W. K. WILSON and G. H. BOTHAM (*Harper Adams Util. Poultry Jour.*, 19 (1933-34), No. 10, pp. 441-445).—Continuing these studies (E. S. R., 69, p. 572), it was found that the edible flesh of female Havana rabbits showed slightly better live and dressed weights than males at 9 mo. of age. The females had a definitely higher fat content than males of the same age, but the males showed a higher percentage of protein. These results confirmed previous observations made with Angora rabbits.

A useful method for anatomical studies in poultry nutrition research, A. F. ROLF (*U. S. Egg and Poultry Mag.*, 40 (1934), No. 12, pp. 18-21, figs. 6).—In this article the author describes a procedure by means of which the effect of feeds upon the vital organs of poultry may be determined. The method consists of solidly freezing the birds as quickly as possible after they are killed and picked, cross sectioning the frozen carcass, and keeping the specimens frozen until the studies are completed.

The effects of ultraviolet irradiation on rachitic chickens, G. M. HIGGINS, C. SHEARD, and R. M. WILDER (*Anat. Rec.*, 58 (1934), No. 2, pp. 205-216, figs. 6).—This study was undertaken to observe the restorative changes which occur in the long bones and in the parathyroid and thyroid glands when rachitic chickens are irradiated with ultraviolet light.

Under this treatment the long bones became firm and hard, the cysts of the cortex disappeared, and normal calcification was restored. The calcium content of the blood returned to normal, but the phosphorus content remained elevated. The greatly enlarged parathyroid glands were reduced to almost normal size, while the hyperplastic thyroid gland resumed the appearance of the normal gland.

High points in chick rearing, D. C. KENNAED, V. D. CHAMEERLIN, and P. R. RECORD (*Ohio Sta. Bmo. Bul.* 172 (1935), pp. 16-18).—In this article the authors discuss successful methods of brooding, feeding, and management of chicks, based upon certain fundamental principles that have been established by practical experience and experimental evidence.

The disposition of Leghorn cockerels, D. C. KENNARD, V. D. CHAMBERLIN, and P. R. RECORD (*Ohio Sta. Bimo. Bul.* 172 (1935), pp. 18-21, fig. 1).—Three methods for disposing of Leghorn cockerels are discussed, namely, selling as broilers when from 10 to 14 weeks of age, selling or destroying when from 2 to 4 weeks of age, and selling or destroying day-old sexed cockerels. It is pointed out that probably the most economical solution of the problem this year will be to provide adequate equipment and care so that the cockerels may be developed into high-quality, marketable broilers.

A new Dutch breed of table-fowl, P. A. FRANCIS (*Jour. Min. Agr. [Gt. Brit.]*, 40 (1933), No. 8, pp. 741-743, pl. 1).—The author describes the development and characteristics of the North Holland Blue breed of chickens.

Ovulation in the domestic hen, D. C. WARREN and H. M. SCOTT (*Science*, 80 (1934), No. 2081, pp. 461, 462).—In studies at the Kansas Experiment Station observations were made on the ovulation of 11 White Leghorn hens. Of these only two had the infundibulum enclosing the ovum at the time of bursting of the theca. In two other cases the ova were picked up immediately, indicating that the infundibulum and the follicle were closely associated at the time of ovulation. In three cases the released ova were not picked up, and in four other cases the infundibulum began to engulf the ovum within periods of 4 to 10 min. after the rupture of the follicular membrane.

At the time of ovulation the blood vessels in the cephalic end of the oviduct were greatly congested, and this portion of the oviduct was very active. There were also some indications of unusual enlargement of the blood vessels of the Graafian follicle. Slightly before the rupture of the follicular membrane the blood supply seemed to be reduced, and there was a noticeable increase in the width of the stigma. The act of rupturing the follicular membrane was instantaneous, and the released ovum was much flattened and assumed the shape of the cavity into which it fell.

Observations indicated that the following periods were spent by the egg in various parts of the oviduct—infundibulum, 18 min.; albumin-secreting section, 2 hr. 54 min.; isthmus, 1 hr. 14 min.; and uterus and vagina, 20 hr. 40 min.

The composition of the proteins of eggs from hens on different diets, H. O. CALVERY and H. W. TITUS (*Jour. Biol. Chem.*, 105 (1934), No. 4, pp. 683-689).—In cooperative studies with the University of Michigan, the U. S. D. A. Bureau of Animal Industry found no marked differences in the composition of the proteins of eggs produced by White Leghorn pullets receiving their proteins from wheat (middlings only), corn (ground corn and corn gluten), and soybeans (oil cake meal).

The effect of shaking on the quality of eggs, H. J. ALMQUIST, B. O. NELSON, and F. W. LORENZ (*U. S. Egg and Poultry Mag.*, 40 (1934), No. 12, pp. 13-16).—The California Experiment Station undertook a study to determine the effect of shaking on the candling appearance of eggs. Eggs were candled for estimation of yolk shadow and air space, and then packed in a small box with flats and fillers. The box was fastened to the center of a 3-ft. board, hinged at one end. The other end of the board was slowly raised and dropped suddenly 1 in. at the rate of 48 times per minute for 1 hr. The eggs were then recandled.

Eggs given a shaking treatment sufficient to cause marked deformation of air spaces and significant increases in yolk shadows did not undergo liquefaction of the white. When the firm white layer was ruptured after shaking, eggs had a significantly lower percentage of firm white and a much greater increase of yolk shadow than did eggs in which the firm white layer was not ruptured. The increased shadow resulting from shaking may have been due to a relaxing of physical structures which tend to hold the yolk in a central position in the egg.

DAIRY FARMING—DAIRYING

Fundamentals of dairy science (*New York: Reinhold Pub. Corp., 1935, 2. ed., pp. 616, pl. [1], figs. [59]*).—This is a revision of the treatise previously noted (*E. S. R.*, 59, p. 165), by the associates of L. A. Rogers.

Proceedings [of the] twentieth annual meeting, western division, American Dairy Science Association (*Amer. Dairy Sci. Assoc., West. Div., Proc. Ann. Meeting, 20 (1934), pp. [3]+93, figs. 5*).—The proceedings, in mimeographed form, of this meeting held at Portland, Oreg., October 7, 1934 (*E. S. R.*, 72, p. 101) are presented.

[Dairy cattle studies in Arkansas], C. O. JACOBSON (*Arkansas Sta. Bul. 312 (1934), pp. 31, 32*).—Experiments with dairy cattle furnished data on the value of a simple home-grown ration compared with a complex ration for growth and lactation in dairy heifers and a comparison of Korean lespedeza hay and alfalfa hay for milk production.

[Dairy cattle and dairy products investigations in Iowa] (*Iowa Sta. Rpt. 1934, pp. 49, 55, 56, 84-91*).—Investigations with dairy cattle yielded results on the influence of diet on the antirachitic potency of cow's milk, by B. H. Thomas and C. Y. Cannon; studies with milk goats as to the relation of vitamin E to sterility in dairy cows, by Cannon, D. L. Espe, and Thomas; and the influence of physical properties of milk on its rate of digestion in vivo, by Cannon and Espe.

With dairy products data were obtained on an organism causing rancidity in butter, micro-organisms causing surface taint in butter, the germicidal property of milk, Iowa market milk—(1) pasteurization efficiency, (2) contamination following pasteurization—classification of the organisms important in dairy products, development of butter cultures from mixtures of organisms, products formed by *Streptococcus citrovorus* and *S. paracitrovorus* from citric acid and from lactic acid, methods of preparing butter cultures for mail shipment, and the importance of acetylmethyl carbinol and diacetyl in butter cultures, all by B. W. Hammer; a method for studying the acids in butter and a semimicro Hanus iodine method, preparation and use of nondesiccated sodium caseinate sols in ice cream and the keeping quality of ice cream made with sodium caseinate sols, and causes of the tallowy flavor in strawberry ice cream, all by E. W. Bird; and a survey of butter manufacturing costs in Iowa creameries, by M. Mortensen and G. S. Shepherd.

[Studies with dairy cattle and dairy products in Nebraska] (*Nebraska Sta. Rpt. [1933], pp. 7, 8, 35*).—Results are noted on a comparison of a grain-supplemented v. roughage-alone ration at the Scotts Bluff Substation, factors affecting the quality of fluid milk, and the manufacture of cream cheese.

[Investigations with dairy cattle and dairy products by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1934, pp. 69, 70, 72, 73, 74, 75, 82, 83*).—Studies with dairy cattle resulted in data on the effect of food fat upon the milk fat and the blood fat of cows and goats, by L. A. Maynard, C. M. McCay, et al.; the relative value of dicalcium phosphate and bone meal as mineral supplements, by Maynard and R. V. Rottensten; the minimum amount of protein in the concentrate mixture for dairy cows fed mixed clover and timothy hay and corn silage, by E. S. Savage, E. S. Harrison, S. H. Work, and Maynard; a study of bull indexes, by Savage and M. Altmann; and the value for dairy cows of early-cut timothy hay fertilized with a nitrogenous fertilizer, by F. B. Morrison, G. W. Salisbury, et al.

With dairy products results are reported on abnormal flavors in milk, by E. S. Guthrie and H. J. Brueckner, and the fat content of foremilk, by H. E. Ross.

[Investigations with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 308 (1934), pp. 16-18*).—Studies with dairy cattle yielded information on pasture fertilization, by S. I. Bechdel, F. D. Gardner, C. F. Noll, J. W. White, and E. S. Erb; dehydrated hay for dairy heifers, by Bechdel, A. W. Clyde, C. O. Cromer, and P. S. Williams; and the effect of cottonseed meal on dairy heifers, by Bechdel, Williams, and S. R. Skaggs.

Dairy products investigation data are reported on testing dairy products for fat, and effect of various feeds on the color content of milk, both by W. D. Swope; and soft-curd milk, by F. J. Doan and R. C. Welch.

[Dairy cattle studies in South Carolina] (*South Carolina Sta. Rpt. 1934, pp. 48-54, 123-127*).—Studies with dairy cattle yielded information on the value of ground corn fodder fed with molasses and cottonseed meal compared with corn silage fed with cottonseed meal for milking cows, grazing tests on Bermuda pasture with milking cows, seasonal variation in returns secured from Bermuda pastures, and effect of certain factors on the butterfat production of Jersey cows, by J. P. LaMaster and E. C. Elting; a comparison of the chemical analysis of carpet grass and Bermuda grass, by Elting, LaMaster, and J. H. Mitchell; and breeding and pasturing investigations at the Sandhill Substation, by E. W. Faires.

[Pasturing sweetclover with dairy cows at the Belle Fourche (S. Dak.) Field Station], B. AUNE, L. A. HURST, and A. OSENBURG (*U. S. Dept. Agr., Tech. Bul. 454 (1934), p. 19*).—Continuing this test (E. S. R., 57, p. 570), it was found necessary to feed 1 lb. of grain for each 4 lb. of milk produced. Over a 7-yr. period sweetclover proved to be a desirable crop on the heavy gumbo soils at the station, not only from the actual cash return per acre of pasture but for the favorable effects on crops that followed.

Green panicum grass v. green Sudan grass for dairy cows, L. A. HENKE (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 8 (1935), pp. 9*).—The double reversal system of feeding was used in two tests with two lots of three cows each to compare the feeding value of the above-named grasses. The concentrate portion of the two rations was the same.

No significant difference was found in the body weight or the butterfat content of the milk of cows fed green panicum grass or green Sudan grass. Milk production was about 9 percent higher when the Sudan grass was fed, but the cows consumed an average of 56.2 lb. of this grass per head daily as compared with only 49.5 lb. of the panicum grass. On the basis of actual quantity of roughages consumed, Sudan grass was worth 96 percent as much as panicum grass, pound for pound. Because of the greater palatability, however, Sudan grass produced more milk, and where both feeds were available in unlimited quantities the Sudan grass was preferable.

Investigations regarding green fodder and methods for its conservation, [I]–[III] [trans. title], H. EDIN, N. BERGLUND, and Y. ANDERSSON (*K. Landtbr. Akad. Handl. och Tidskr., 70 (1931), No. 6, pp. 845-947, figs. 11, Eng. abs., pp. 938, 939, 946, 947; 72 (1933), Nos. 3, pp. 297-392, figs. 6, Eng. abs., pp. 386-392; 4, pp. 502-540, Eng. abs., pp. 537-540*).—These investigations were divided into three parts.

In part 1 the results of researches during 1928 and 1929 by the Government experiment station of Sweden in cooperation with the Swedish Association of Agricultural Engineering on certain methods of preserving forages are reported. Included in the study were investigations concerning the nutritional problems of preservation of green forage, technical investigations into grass drying by furnace gases in a rotary kiln, and various methods of artificial grass drying.

In part 2 the results of tests on the feeding value of rotation hay crops of central Sweden are given. Other data included cover changes in composition, digestibility, and feeding value during the growing season; haymaking of clover aftermath; effect of drying with furnace gases in a rotary kiln and of drying at low atmospheric pressures on feeding values; effect of the addition of hydrochloric acid or sugar or both on the quality of the silage made from aftermath; and losses in net energy of the green fodder silages.

In part 3, entitled *Silage Made from Marrow Stem Kale and Turnip Tops*, results are reported on the composition and digestibility of marrow stem kale and the silage made from it and the tops of swedes.

The differences in composition and digestibility of the samples of kale were chiefly due to differences in the type of growth. The fleshy center of the stems was of higher digestibility than the outer layer, which consisted largely of lignified supporting tissue. On this basis it appeared that the thinner stands of kale with the larger stems were the more valuable. Large amounts of this kale fed to dairy cows produced a butterfat with an iodine number of approximately 34. It is suggested that it would be good practice to feed kale to improve the consistency of Swedish butter.

Cottonseed meal as the principal source of protein for dairy animals, O. C. CUNNINGHAM and L. H. ADDINGTON (*New Mexico Sta. Bul. 226 (1934), pp. 43, figs. 17*).—Continuing this study (*E. S. R.*, 65, p. 259), it was shown that the growth of animals on each ration was below normal and the animals lacked sleekness up to 6 mo. of age. The rations fed in the first three lots, which included either alfalfa hay or corn silage or both, produced good growth by the time the animals were 15 mo. old, but the group fed corn, cottonseed meal, and cane hay never attained the same development as those in the other groups. The animals in all lots gnawed boards, indicating that none of the rations was complete. Reproduction was unsatisfactory on all rations, with a slight advantage in favor of the rations containing alfalfa hay. The milk production was very good in the first three lots, but in lot 4 while still good was about 20 percent lower than in the other lots. Only one case of what appeared to be cottonseed meal injury occurred during the test. It is concluded that cottonseed meal may be safely used as the principal source of protein in dairy rations if good quality roughage is fed.

Manufacture, composition, and utilization of dairy byproducts for feed, M. R. COE (*U. S. Dept. Agr. Circ. 329 (1934), pp. 16, figs. 6*).—The various processes used in the manufacture of the dairy byproducts—condensed and dried buttermilk, condensed and dried skim milk, and dried whey—are described. The composition, utilization, and nutritive value of these byproducts are discussed.

The structure of the cow's udder, C. W. TURNER (*Missouri Sta. Bul. 344 (1935), pp. 16, figs. 19*).—The internal structure of the udder, the mode of milk secretion, and the blood supply, lymphatic system, and nervous system of the udder are described in this bulletin.

A study of the effects of hand and machine milking on the milk yield, its composition and purity, H. B. DAVEL and H. L. NEETHLING ([*Union So. Africa*] *Dept. Agr., Sci. Bul. 111 (1932), pp. 23, figs. 6*).—At the Dairy Research Institute, Pretoria, it was found possible to produce milk with lower total counts with a milking machine than was generally possible with hand milking, but under average farm conditions there was a tendency for machine-drawn milk to have a higher total count than hand-drawn milk. The *Escherichia coli* counts were always smaller in machine-drawn milk.

Hand-drawn milk was higher in butterfat and milk solids-not-fat than machine-drawn milk, and the difference was not due to experimental error. The slight difference in yield in favor of hand milking was not statistically significant.

The nutritional value of milk and milk products, S. K. KON (*Jour. Dairy Res. [London]*, 5 (1934), No. 3, pp. 250-268).—The National Institute for Research in Dairying, England, reviews the literature dealing with the nutritional value of milk under the following headings: Nutritional value as estimated in laboratory experiments with raw milk, treated milk, and butter, and the nutritional value for human beings of raw milk and treated milk.

Variations in the solids-not-fat content of milk.—III, **The lactation yield and factors affecting it**, S. BARTLETT (*Jour. Dairy Res. [London]*, 5 (1934), No. 3, pp. 179-184, fig. 1).—Continuing these studies (E. S. R., 72, p. 526), the author traces the influence of age on milk yield and milk solids. The yield of milk reached a maximum at about the sixth lactation and then declined, while the concentration of fat and solids-not-fat showed a gradual decline from the first lactation. During lactations in which milk yield was below normal productivity, the quality of the milk tended to be subnormal.

Non-pathogenic haemolytic streptococci occurring in milk, F. C. MINETT and A. W. STABLEFORTH (*Jour. Dairy Res. [London]*, 5 (1934), No. 3, pp. 223-232, pl. 1).—This paper from the Research Institute in Animal Pathology, London, contains a description of the characters of certain streptococci which are sometimes found in small numbers in the milk of individual cows. These organisms possessed high hemolytic activity, but showed no evidence of pathogenic power either for the cow's udder or for ordinary small laboratory animals. One of the principal characters of the organisms was the formation on solid mediums of minute colonies consisting of relatively minute cocci, which grew in broth as very short chains.

The 58 strains studied could be divided by biochemical means into two groups: (1) Those fermenting glucose and lactose with the production of small amounts of acid, and (2) those which fermented mannite and salicin in addition. The former were designated as "low acid" strains and the latter as *Streptococcus infrequens*. Both groups fermented sorbite and trehalose, and could be distinguished from *S. pyogenes* and ordinary mastitis *Streptococcus* by direct agglutination.

Observations on sudden changes in the rate of acid formation in milk by cultures of lactic streptococci, H. R. WHITEHEAD and G. A. COX (*Jour. Dairy Res. [London]*, 5 (1934), No. 3, pp. 197-207).—The sudden failure in the growth of cheese starter cultures during studies at the Massey Agricultural College, New Zealand, is described. The cause of the failure was found to be the method of pasteurizing the milk in which the cultures were grown.

Aeration of the milk immediately before inoculating with certain cultures had an inhibiting effect on the growth of the organisms. Normal starter cultures were not affected by such aeration, but at times suddenly developed a sensitivity to aeration and as suddenly reverted to the normal state. The absorption of atmospheric oxidation while milk was being cooled following pasteurization in a wide mouthed cylindrical vessel was sufficient aeration to inhibit growth of sensitive cultures of lactic acid streptococci.

Evidence is presented to show that the possible mechanism of this inhibition was connected with the oxidation-reduction reactions by means of which the organisms normally obtained their growth energy. The practical significance of these findings to cheese manufacture is discussed.

A coliform organism isolated from milk.—The effect of temperature on the fermentation of lactose, E. R. HISCOX (*Jour. Dairy Res.* [London], 5 (1934), No. 3, pp. 233-235).—In this paper from the National Institute for Research in Dairying, Reading, the author describes the morphology and cultural reactions of an active lactose-fermenting organism isolated from milk.

Bacteriological changes in acidophilus milk at room and ice-box temperatures, L. M. KOPELOFF, J. L. ETCHHELLS, and N. KOPELOFF (*Jour. Bact.*, 28 (1934), No. 5, pp. 489-500, figs. 2).—In this study it was found that the viability of rough and smooth strains of acidophilus milk of the same titratable acidity differed at 4° and 20° C. The rough strain, the only one that has been proved to have therapeutic value, lost its viability rapidly when stored at 4° or 9° as compared with storage at 20° to 30°. With an initial titratable acidity of 0.6 to 1 percent the original count diminished 90 percent in 3 days in an ice box as compared with 20 and 75 percent reduction at room temperatures. The smooth strain of acidophilus milk lost its viability less rapidly than the rough strain but was also more susceptible to cold than to warm temperatures.

Factors affecting the solubility of milk powders.—III, Some physico-chemical properties of concentrated solutions of milk solids, G. R. HOWAT and N. C. WRIGHT (*Jour. Dairy Res.* [London], 5 (1934), No. 3, pp. 236-244, figs. 4).—Continuing this series of studies (E. S. R., 70, p. 673), it was found that the effect of increasing concentrations of milk solids on the degree of ionization of electrolytes could not be measured by determinations of electrical conductivity. This was due to the influence of viscosity on ionic mobility. There was an approximately linear relationship between concentration of milk solids and the freezing point depression. Above a concentration of 34 g of milk solids per 100 g of water, solutions were saturated with respect to lactose, and any increase in freezing point depression beyond this point was limited to that caused by other osmotically active constituents of milk. There was no evidence of the existence of "bound" water in solutions of milk solids equivalent to 65 g of milk solids per 100 g of water. There was an approximately linear relationship between the concentration of milk solids and pH concentration, an increase in milk solids resulting in a marked increase in acidity.

The application of these results to heat coagulation of evaporated and dried milks is described.

The effect of milk upon metals and metals upon milk, B. H. WHITFIELD, H. P. DAVIS, and P. A. DOWNS (*Milk Dealer*, 24 (1934), Nos. 2, pp. 34, 35, 78; 3, pp. 40-42, figs. 5; 24 (1935), No. 4, pp. 42-44, 48, figs. 5).—This investigation was undertaken at the Nebraska Experiment Station to determine the corrosive effect of milk upon copper, nickel, Aluminum 3S, Inconel, and allegheny metal and the effect of these metals upon milk under certain conditions.

Copper and nickel were the only metals that corroded, and as a rule there was a heavier loss of nickel than of copper. Under an atmosphere of oxygen copper corroded more during a 4-hr. exposure than did nickel. The weight losses of the other metals were within the range of experimental error. At 144° F. an atmosphere of oxygen caused the greatest corrosion, air next, and carbon dioxide the least corrosion of strips of copper and nickel in milk. Corrosion was less at 60° than at 144°, and the corrosion of copper at 60° was practically the same under the three atmospheres. For nickel an atmosphere of carbon dioxide at 60° caused the greatest corrosion, and there was practically no difference under the other atmospheres. Weight losses were greater as the exposure time increased, but corrosion rates were greater when determined from short periods of exposure. The rate of corrosion varied with the amount of surface per unit volume of milk exposed to the atmosphere. Copper was

brightened and nickel darkened by exposure to milk, the intensity of discoloration being increased in an atmosphere of oxygen and long-time exposure and decreased by an atmosphere of carbon dioxide. The discoloration was also greater at 144° than at 60°.

Copper always caused a "cappy" or tallowy flavor to develop in milk within 18 to 24 hr. after exposure, and the off flavor was affected by the time of exposure and the length of storage. The flavor was greatly increased by an atmosphere of oxygen and decreased by an atmosphere of carbon dioxide. Nickel produced a metallic flavor only when corrosion was great, while the other metals apparently produced no flavor defects. An atmosphere of carbon dioxide always gave a high acid flavor to milk. Neither the acidity nor pH of milk samples was affected by exposure to metals. An atmosphere of carbon dioxide increased the acidity and lowered the pH, but these factors tended to return to normal after storage at low temperatures. The chloride or lactose content of milk was not significantly changed by exposure to metals at 60° or to the different atmospheres. The bacterial count was not affected by the metals, while exposures at 144°, an atmosphere of carbon dioxide, and low storage temperatures all tended to reduce bacterial counts.

Copper produced a greenish color in milk when exposed at 144°, particularly in an atmosphere of oxygen. Nickel sometimes caused this discoloration, but the other metals had no such effect. Holding milk at 55° to 60° for 15 hr. after milking had no effect on the corrosion rate of nickel at 144° under an atmosphere of air.

Variations in the Reichert-Meissl, Polenske, and iodine numbers and refractometer readings of Hungarian butters, according to the seasons, with respect to feeding and the correlation between these constants of milk fat [trans. title], S. PÉTER (A. PETER) and I. KRON (S. KRON) (*Kisérlet. Közlem.*, 36 (1933), No. 1-3, pp. 192-203, figs. 2; *Eng. abs.*, p. 203).—An investigation by the Hungarian Control Station for Dairy Products, Budapest, showed no great difference in the Reichert-Meissl numbers of winter and summer butters. On the other hand, refractometer readings indicated sharply any changes in the feeding of animals. Readings of winter butters were between 40.5 and 42 and those of summer butters between 42 and 44.5, while during the transition period the readings varied according to the actual feeding. While no connection was found between the Reichert-Meissl numbers and refractometer readings, very low readings were found associated with very high numbers and vice versa.

A close correlation existed between the refractometer readings and the iodine numbers, and it was possible to calculate either of these variables with accuracy if the other were known. There was also a close correlation between the Reichert-Meissl and Polenske numbers when green feeds were fed, but when the ration was made up of winter fodders the correlation no longer existed because the Polenske number showed a relatively greater increase than the Reichert-Meissl number.

Studies in the ripening of Cheddar cheese.—IV, The bacterial flora of cheese made from milk of a very low bacterial count; V, The influence of the rennet flora on the flora of the cheese; VI, The influence of the starter on the ripening process, L. A. ALLEN and N. R. KNOWLES (*Jour. Dairy Res.* [London], 5 (1934), No. 3, pp. 185-196).—Continuing this investigation (E. S. R., 70, p. 379) at the University of Reading, England, it was found that the flora of rennet could not be detected as contributing to the micro-organisms concerned in the ripening of cheeses made either with a vigorous or with a slow starter. In cheeses made from milk of a very low bacterial

count the predominant flora during the first 19 to 20 weeks were lactic acid streptococci. When lactobacilli were present initially they displaced the streptococci at later stages of ripening and became predominant. The effect of a vigorous starter in inducing subsequent proteolysis was very marked in comparison with that of a weak starter made up of two pure species of streptococci. This was thought to be due to the symbiotic effect of a mixture of organisms.

Milk produced under very clean conditions may lack lactobacilli entirely, or the few species present may not be of a type able to contribute to the ripening process. In either case one factor regarded as essential to the production of full flavor and proteolysis in Cheddar cheese was missing. Most of the lactic acid streptococci and lactobacilli isolated during the ripening process were of a type unable to make vigorous growth in milk without the addition of a suitable source of nitrogen. Since this nutritional factor was absent in milk of low bacterial count, it had to be supplied artificially to insure proper growth of the organisms.

The influence of lactic streptococci on the ripening of Cheddar cheese, I. R. SHERWOOD and H. R. WHITEHEAD (*Jour. Dairy Res.* [London], 5 (1934), No. 3, pp. 208-222, figs. 4).—In studies at the Massey Agricultural College, New Zealand, the process of ripening in experimental cheeses was followed by periodic estimations of the amounts of various types of protein degradation products formed.

There appeared to be no relation between the type of nitrogen partition and the commercial quality of the ripened cheese. The proteolytic powers of the pure cultures of streptococci used as starters had little influence on the rate of proteolysis in cheeses during ripening. The trend of protein break-down was governed by the rate and total extent of acid formation in the milk and curd during manufacture. This suggested that the rennet enzyme was the principal proteolytic agent and that the function of streptococci was the formation of acid, which in turn influenced the rate of action of the rennet enzyme.

There was no relation between the numbers of streptococci present in the cheese milk at the time of renneting and the rate of ripening. There was some evidence that minor differences in the type of protein degradation during the ripening period influenced the changes of bacterial flora in the cheese. Lactobacilli appeared to develop earlier where the proportion of simple protein derivatives was high.

Making American cheese on the farm for home consumption, H. L. WILSON (*U. S. Dept. Agr., Farmers' Bul.* 1734 (1934), pp. 11-18, figs. 17).—This is a revision of and supersedes Farmers' Bulletin 1191, previously noted (*E. S. R.*, 45, p. 381).

The effect of density of ice cream on the costs of ingredients, O. E. WILLIAMS (*Ice Cream Trade Jour.*, 30 (1934), No. 8, pp. 30-32).—In this article from the U. S. D. A. Bureau of Dairy Industry the author presents data to show the effect of changes in type and density of ice cream and in prices paid for milk solids on the cost of each basic ingredient in a gallon of ice cream.

Milk soluble sodium alginate as a suspending agent in chocolate milk, P. H. CATE (*Milk Dealer*, 24 (1935), No. 4, pp. 74, 75, figs. 2).—In this article the author describes the advantages and use of a milk-soluble form of sodium alginate in the preparation of nonsettling chocolate milk.

VETERINARY MEDICINE

Treatise on microbiology, II, edited by L. NATTAN-LARRIER (*Traité de microbiologie*. Paris: G. Doin & Co., 1934, vol. 2, pp. [4]+1138, pls. 8, figs. 104).—In this second volume (*E. S. R.*, 66, p. 665) part 3, on the pathogenic

bacteria, prepared in collaboration with 18 authors, is completed. The bacteriological analysis of water is dealt with by H. Violle in an appendix (pp. 987-1013). A list of illustrations, subject and author indexes, and a table of contents follow.

A contribution to the cytology of microbes (Coccus, Bacillus, Vibrio, Spirillum, Spirochaeta) [trans. title], A. C. HOLLANDE (*Arch. Protistenk.*, 83 (1934), No. 3, pp. 465-608, pls. 8, figs. 20).—This report of studies is presented with a five-page list of references to the literature.

Developments in the study of agglutinins, R. A. K[ILDUFFE] (*Jour. Lab. and Clin. Med.*, 19 (1934), No. 10, pp. 1144-1150).—A summary of recent findings, presented in connection with a list of 10 references.

[Work in animal pathology and bacteriology at the Colorado Station] (*Colorado Sta. Rpt. 1934*, pp. 25-27).—The work of the year briefly referred to (E. S. R., 70, p. 674) includes that relating to vaccination of lambs on the range for sore mouth, coccidiosis of lambs, death losses on heavy grain feed, swine erysipelas, encephalomyelitis, and anaplasmosis.

[Work with livestock diseases by the Nebraska Station] (*Nebraska Sta. Rpt. [1933]*, pp. 6, 7).—Brief reference is made to the progress (E. S. R., 69, p. 578) of studies of blackhead in poultry and of erysipelas in swine.

[Contribution on diseases of sheep and of cattle], A. D. McEWEN (*Jour. Southeast. Agr. Col., Wye, Kent*, No. 35 (1935), pp. 45-56).—The diseases reported upon include struck, gangrene, acute hematogenous jaundice, infectious enterotoxemia or pulpy kidney disease, Johne's disease, and parasitic gastritis of sheep, and contagious abortion and mastitis of cattle.

An attempt to transmit anaplasmosis by British biting flies, E. L. TAYLOR (*Vet. Jour.*, 91 (1935), No. 1, pp. 4-11).—The attempted transmission of anaplasmosis by the tabanid *Haematopota pluvialis* and by the stable fly here reported gave negative results.

Anthrax, W. S. GOCHENOUR (*U. S. Dept. Agr., Farmers' Bul. 1736* (1934), pp. II+14, figs. 5).—This account supersedes that given in Farmers' Bulletin 784 (E. S. R., 36, p. 779).

A contribution to the study of Aujeszky's disease [trans. title], D. JONNESCO (*Ann. Inst. Pasteur*, 53 (1934), No. 5, pp. 554-563).—This is an extended account (E. S. R., 72, p. 382) of an experimental study of a strain of the virus of Aujeszky's disease isolated from the brain of a dog, including inoculations to determine the susceptibility of various animals and hemato- and histo-logical work. It is pointed out that earlier investigators have found the mouse, carnivores, cattle, sheep, and swine to be susceptible to the disease.

Experimental studies on Trypanosoma cruzi in California, F. D. WOOD (*Soc. Expt. Biol. and Med. Proc.*, 32 (1934), No. 1, pp. 61, 62).—In studies supplementing the work of Kofoid and Donat (E. S. R., 69, p. 425), in which examinations were made of the feces of a group of a reduviid carrier of *T. cruzi* Chagas, namely, *Triatoma protracta* Uhler, 54 percent were found to be infected. The *T. protracta* in the vicinities of Berkeley and Los Angeles appear to be free from trypanosomes in their digestive tracts. Of 134 animals representing 16 species that were inoculated with the California strain of *T. cruzi*, 67 animals representing 12 species became infected. The southern parasitic mouse, the San Diego desert mouse, and the Virginia opossum, all associated with San Diego wood rats in nature, were found to be more susceptible to the infection in the laboratory than were the rats themselves, and it is possible that they, too, may be natural carriers of *T. cruzi*. See also earlier work (E. S. R., 72, p. 531).

The relation of the avian tubercle bacillus to tuberculosis in swine and incidentally in cattle, J. McCARTER, B. A. BEACH, and E. G. HASTINGS (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 2, pp. 168-175).—Contributing from the

Wisconsin Experiment Station, the authors report having found the avian tubercle bacillus to be almost wholly responsible for lymph node tuberculosis of hogs in that State, it being the type of the disease most prevalent. What is considered a new species of *Mycobacterium* was isolated from one specimen of hog lymph node tissue.

It is concluded from the authors' observations and a survey of the literature that there may be a passage of the avian tubercle bacillus from hogs to other hogs, to poultry, and to cattle. It is pointed out that the infection of cattle with avian tubercle bacilli may be of more importance than has hitherto been supposed.

A list of 19 references to the literature is included.

On epizootology of tularemia.—I, The role of ectoparasites in the tularemia epizootic of ground squirrels [trans. title], A. A. VOL'FERTS (VOLFERZ) S. A. KOLPAKOVA, and A. A. FLEGONTOVA (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.)*, 13 (1934), No. 2, pp. 103–118, figs. 5; *Eng. abs.*, pp. 116–118).—The author's studies have shown that *Bacterium tularense* having hibernated in hostless parasites, namely, fleas (*Ctenophthalmus pollex* Wagn.), during 3 mo., may in the spring produce an intensive epidemic among ground squirrels or susliks (*Citellus pygmaeus* Pall.). In the winter of 1933–34 the presence of an epizootic of tularemia among the micelike rodents (*Microtus arvalis* Pall., *Lagurus lagurus* Pall., and *Mus musculus* L.) was established by different investigators. Suslik burrows have been discovered in the very midst of the colonies of micelike rodents which settled at different stations, those occupied by susliks included. "By the time when the young of *C. pygmaeus* settle down, the density of population of hibernated fleas that have parasitized on field mice perished of epizootics has decreased, while the remaining fleas have not lost their vitality. In case the burrow of a micelike rodent is visited by a suslik, the fleas of the dead rodent find a new host to feed upon after their long starvation."

The laboratory diagnosis of undulant fever, R. A. K[ILDUFFE] (*Jour. Lab. and Clin. Med.*, 19 (1934), No. 9, pp. 1029–1032).—A review of the present status of the subject, presented with nine references to the literature.

A study of various fractions of *Brucella abortus*, I–III, R. GWATKIN (*Canad. Jour. Res.*, 12 (1935), No. 1, pp. 115–145, figs. 3).—In part 1 the author reports on studies of the preparation, toxicity, and biochemical nature of the alcoholic precipitate of *B. abortus* (pp. 115–124), in part 2 on complement fixation and intradermal tests with the alcoholic precipitate (pp. 125–132), and in part 3 on immunity experiments with the alcoholic precipitate (pp. 133–145).

Effects of certain environmental influences on the longevity of *Brucella abortus suis*, W. H. FELDMAN and C. OLSON, JR. (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 2, pp. 153–161).—In the studies reported the authors employed a culture of *B. abortus suis* obtained by direct culture from a bone abscess in a case of spontaneous spondylitis of a hog. It was found that this organism, when suspended in a liquid medium, is extremely resistant to freezing and is able to withstand temperatures of from -15° to -20° F. for as long as 400 days. It has a short or limited length of life when exposed to an environment devoid of moisture and when subjected to brilliant sunshine.

Bang's disease (infectious abortion), M. H. CAMPBELL (*Vermont Sta. Bul.* 382 (1934), pp. 20, fig. 1).—This contribution, which supplements the information given in Bulletin 231 (*E. S. R.*, 50, p. 381), reviews the experiences of the station during the past 7 yr. in combating Bang's disease in the station dairy herd. Blood tests were made from 1927 to August 1930 with reacting and non-reacting cows housed and pastured together, the reactors being isolated at calving time. Under this system of management the infection spread at three

different times. Commencing in August 1930, reacting cows were removed and isolated maternity pens so equipped that all cows could be removed from the herd for calving, since which time the spread of infection has been negligible. Several abortions occurred among animals classified as negative, but in some cases *Brucella abortus* does not seem to have been the causative agent.

It is concluded that greater progress in building up a disease-free herd can be made where it is possible to remove all reacting animals, and isolation at parturition should be followed whether positive and negative animals are or are not completely isolated. A practical account of the present knowledge of the disease and the procedure to be followed in its eradication from a herd is included.

Investigations respecting the relation between the agglutination value of the cow and the bacillus content of the milk in the disease (infectious abortion in cattle, Bang infection) [trans. title], VIRIDÉN (*Skand. Vet. Tidskr.*, 24 (1934), No. 12, pp. 711-717; *Eng. abs.*, pp. 716, 717).—The author's studies confirmed the conclusion of Tullberg that the higher the agglutination value the more frequent the presence of *Brucella abortus* in milk. *B. abortus* was found by the author to occur in the milk in 50 percent of the cows examined that had an agglutination value of 50 and in 56 percent of the cows examined that had an agglutination value of 70.

Hematological studies on cattle.—I, The hemoglobin, erythrocytes, and leucocytes in different breeds of cattle in the college of agriculture, M. MANRESA and N. C. REYES (*Philippine Agr.*, 23 (1934), No. 7, pp. 588-603).—Following an introduction and review of earlier work on the subject in connection with a list of six references, the authors report upon materials and methods of procedure and discuss the findings in work at the experiment station of the University of the Philippines.

Premunition against paratuberculous enteritis or Johne's disease of bovines [trans. title], H. VALLÉE, P. RINJARD, and M. VALLÉE (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 20, pp. 1074-1076).—The authors conclude from their extended experiments, reported upon first in 1924⁵ and again in 1926 (*E. S. R.*, 57, p. 874), that the premunition against paratuberculous enteritis by subcutaneous injection of from 5 to 10 mg of a living unmodified culture of *Mycobacterium paratuberculosis* in an irrisorbable excipient (vaseline and pulverized silica) is inoffensive and effective. The number of animals protected by the authors in this way include 803 in 1929, 3,158 in 1931, 9,678 in 1933, and 12,866 for the first 5 mo. of 1934. The reactional focus created at the point of the premunition is said to persist and remain active for from 8 mo. to 6 yr., with an average of 1 yr. It is considered desirable to use this means of combating the disease in conjunction with the early slaughter of carrier animals.

A circumscribed squamous crustated dermatitis of the bovine in Dutch East Indies known as "cascado", II [trans. title], J. E. W. IHLE and M. E. IHLE-LANDENBERG (*Nederland. Indische Bl. Diergeneesk.*, 45 (1933), No. 4, pp. 279-284, pls. 3; *Ger., Eng. abs.*, pp. 282, 283).—Under the name *Stephanofilaria dedoesi* n. g. and sp. the authors describe a nematode of the family Filariidae which lives in the skin of cattle in Dutch East Indies.

A circumscribed squamous crustated dermatitis of the bovine in Dutch East Indies known as "cascado", I [trans. title], C. BUBBERMAN and F. C. KRANEVELD (*Nederland. Indische Bl. Diergeneesk.*, 45 (1933), No. 4, pp. 239-278, pls. 8, fig. 1; *Ger., Eng. abs.*, pp. 277, 278).—A report is made of a study of the affection caused by *Stephanofilaria dedoesi*, above described, which in the adult

⁵ *Compt. Rend. Acad. Sci. [Paris]*, 178 (1924), No. 1, pp. 152-154.

stage lives in the epithelium of the cutis. The name dermatitis verminosa bovis is proposed for this condition in place of cascado, a collective term.

A nematode, *Stephanofilaria stilesi* new species, from the skin of cattle in the United States, B. G. CHITWOOD (*North Amer. Vet.*, 15 (1934), No. 6, pp. 25-27, figs. 5).—Under the name *S. stilesi* the author describes a nematode first received from Denver, Colo., and later from Pierre, S. Dak., and Lincoln, Nebr. It is the cause of a skin disease of cattle.

Nematodes as the cause of a recently discovered skin disease of cattle in the United States, G. DIKMANS (*North Amer. Vet.*, 15 (1934), No. 6, pp. 22-25, figs. 4).—This is an account of a dermatitis of cattle caused by the nematode above described by Chitwood as *Stephanofilaria stilesi*. The affection, which was first described by Bubberman and Kraneveld in 1933 from Dutch East Indies, where it was found to be produced by *S. dedoesi* n. g. and sp. of Ihle and Ihle-Landenberg (see above), is characterized by skin lesions varying in size from a few millimeters to 25 cm in diameter. *S. stilesi* has been isolated from skin lesions occurring in cattle in Colorado, South Dakota, Nebraska, and Wyoming.

Outline for a campaign against the common sheep liver fluke and the large American cattle fluke in the United States, M. C. HALL (*North Amer. Vet.*, 15 (1934), No. 6, pp. 48-55, fig. 1).—A plan of procedure in conducting a campaign against *Fasciola hepatica* and *F. magna* is outlined and charted.

The morphology and evolution in nutritive media of the causative organism of contagious agalactia of sheep and goats [trans. title], NOWAK and I. LOMINSKI (*Ann. Inst. Pasteur*, 53 (1934), No. 4, pp. 438-448, pl. 1).—The authors find the causative organism of contagious agalactia of sheep and goats to belong to the contagious pleuropneumonia group, of which only the two forms are known.

The influence of skin wounds made during shearing on the incidence of caseous lymphadenitis in sheep, L. B. BULL and C. G. DICKINSON (*Jour. Council Sci. and Indus. Res. [Aust.]*, 7 (1934), No. 4, pp. 201, 202).—The results reported are considered to have clearly demonstrated that if sheep are protected from skin injuries such as those received in the shearing shed the incidence of caseous lymphadenitis due to *Corynebacterium ovis* can be considerably reduced.

Pregnancy disease in sheep, C. ELDER and A. W. UREN (*Missouri Sta. Bul.* 345 (1935), pp. 15, figs. 5).—Losses in sheep, in some cases rather heavy, have occurred for many years in all parts of Missouri as the result of a disease known under many different names and designated by the authors as "pregnancy disease." Their investigations developed the fact that more than 75 percent of the cases occurred in thin ewes or in animals in only fair condition. The losses in affected flocks were found to vary from 1 to 25 percent. While the exact cause of the disease is not known, the authors are of the opinion that it is largely concerned with problems of feeding and management and is probably closely associated with a disturbance in the carbohydrate metabolism. In most cases the affected animals were in flocks that had been fed on timothy hay, corn stover, oat straw, and poor pasture, and had received no grain other than corn. Attempts to produce experimental cases have thus far given unsatisfactory results. The disease has been seen most often during the period extending from 3 to 4 weeks prior to and up to the time of lambing and has been confined almost entirely to mature or aged ewes that have been carrying twins or triplets. When animals are found carrying singles the lambs are unusually large and well developed. The sick ewes linger for several days before death takes place, and the mortality rate of affected sheep is well over

90 percent. The most characteristic change found after death is the yellow color of the liver, which upon microscopic examination shows marked fatty degeneration changes.

"All attempts in developing a curative treatment have been unsuccessful. Recovery does take place, however, if the animals are able to lamb before the disease has progressed too far and the changes in the internal organs have become too severe. Excellent results in preventing the disease in flocks having the trouble have been obtained by changing the ration. A legume hay, such as alfalfa, clover, or soybean hay, supplemented with a good grain ration and fed twice daily, at the same time allowing the ewes to take a moderate amount of exercise, has given excellent results in preventing the trouble."

The nematodes of sheep in Manawatu district, New Zealand, J. H. TETLEY (*Jour. Helminthol.*, 12 (1934), No. 4, pp. 183-196).—The author has found 25 species of nematodes to parasitize sheep in the Manawatu district of New Zealand, those of the greatest economic importance having been found in most cases to be those of importance in other temperate climates. The contribution is presented with a list of 13 references to the literature.

Incidence and importance of Brucella infection of swine in packing-houses, S. H. McNUTT (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 2, pp. 183-191).—A modification of the rapid agglutination test for the detection of *B. abortus* infection which the author has found satisfactory for use with whole blood is described. Of 1,547 hogs tested, 2.3 percent reacted in dilutions of 1:50 or higher. Cultures from tissues of such reacting hogs yielded *B. abortus* in about 41 percent of the cases. A list is given of 17 references to the literature.

Organic lesions in swine caused by Brucella suis, G. T. CREECH (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 2, pp. 211-216, figs. 5).—A report is made of the changes caused by *B. suis* in the kidneys, liver, and hepatic lymph gland of a hog. This is thought to be the first reported record of lesions in the parenchymatous organs due to *B. suis*.

A pasteurella-like microorganism in the brains of horses suffering from so-called cornstalk disease, R. GRAHAM (*Science*, 81 (1935), No. 2093, pp. 153, 154).—In preliminary observations at the Illinois Experiment Station of the bacterial flora of brains of horses affected with an acute encephalitic disease, referred to as "cornstalk disease", visible areas of degeneration were encountered in the cerebrum in 6 of 7 brains examined. The 7 horses supplying material are said to have originated on 7 different farms in 3 counties. Animal inoculations of the brain tissue suspensions in saline of 2 horses, together with the inoculation of 5 mixed cultures made from the brains, yielded pure cultures of a pathogen possessing the characters of the pasteurella group.

It is pointed out that pasteurellosis infection has long been recognized as an etiological factor in so-called cornstalk disease of cattle, but so far as known by the author *Pasteurella equiseptica*-like strains have not heretofore been isolated from the brains of horses suffering from the disease.

Equine encephalomyelitis in Kansas, E. E. LEASURE (*North Amer. Vet.*, 15 (1934), No. 6, pp. 16-21, figs. 4).—A review is given of the occurrence of equine encephalomyelitis in Kansas during the two years preceding, with information on its etiology, symptoms, diagnosis, prophylaxis, and treatment.

Propagation of virus of equine encephalomyelitis after intranasal instillation in the guinea pig, B. F. HOWITT (*Soc. Expt. Biol. and Med. Proc.*, 32 (1934), No. 1, pp. 58-60).—The evidence obtained from the experiments conducted indicates that "the virus of equine encephalomyelitis, when given intranasally, gains entrance primarily into the blood stream, presumably through

the vascular nasal mucosa, and that there is a systemic septicemic invasion before localization in the nerve tissue."

Intranuclear inclusions in brain of chick embryo after inoculation of egg with virus of equine encephalomyelitis, W. P. COVELL (*Soc. Expt. Biol. and Med. Proc.*, 32 (1934), No. 1, pp. 51-53).—Intranuclear inclusions closely resembling those occurring in Borna disease and in poliomyelitis having been found by Hurst (*E. S. R.*, 71, p. 538) in the nerve cells of animals suffering from equine encephalomyelitis, the author reports upon a search made for inclusions in the brain of the chick embryo after inoculation of the developing egg with the virus of equine encephalomyelitis. This resulted in the finding of inclusion bodies in the embryonic nerve cells in abundance in from 18 to 24 hr. They were more numerous in the various regions of the brain and appeared in a shorter time in the case of the New Jersey virus used than with the California strain. In no instance were intranuclear inclusion bodies of the type found in the nerve cells of embryos infected with equine encephalomyelitis apparent in the brains of the embryos infected with the virus of Borna disease or poliomyelitis.

Active immunization with the virus of equine infectious encephalomyelitis in Argentina: A comparison with the California virus [trans. title], F. ROSENBUSCH (*An. Soc. Rural Argentina*, 68 (1934), No. 7, pp. 373-375).—The author has found that the Argentine virus of equine encephalomyelitis, though less virulent, conveys a high immunity against the California virus.

Susceptibility of non-immune, hyperimmunized horses and goats to eastern, western, and Argentine virus of equine encephalomyelitis, K. F. MEYER, F. WOOD, C. M. HARING, and B. HOWITT (*Soc. Expt. Biol. and Med. Proc.*, 32 (1934), No. 1, pp. 56-58).—The authors' observations indicate a very close relationship between the western United States and the Argentine virus received from Rosenbusch, not only with respect to infectivity but also with regard to cross-protection. "By contrast the eastern virus of 1933 exhibits a greater virulence and thus may break the immunity established against the western virus. On the other hand, the eastern virus apparently protects against the western virus. Further, these experiments lend considerable support to the conception of an insect transmission of the encephalitis virus as demonstrated by Kelser [*E. S. R.*, 69, p. 434]. The eastern virus infects readily by the cutaneous route, and the infective agent circulates for many hours in the blood of the horse."

Preliminary notes on the treatment of equine tetanus by means of intrathecal injection of antitetanic serum, L. M. YUTUC (*Philippine Jour. Anim. Indus.*, 1 (1934), No. 5, pp. 285-290).—In this contribution the procedure of the operation for the intrathecal injection of tetanus antitoxin in the equine is described. Of three animals treated in this way with tetanus antitoxin two recovered, while the third died from tetanus infection in spite of the comparatively larger dose given. The results obtained are considered to have demonstrated the superiority of the intrathecal over the intravenous injection of tetanus antitoxin. The period of convalescence in these cases is said to have been decidedly shorter than those previously observed by the author.

Production of immunity to canine distemper by serum concentrate—living virus, simultaneous injections.—**Preliminary report**, G. W. LITTLE and W. J. LENTZ (*Jour. Amer. Vet. Med. Assoc.*, 83 (1933), No. 3, pp. 405-409).—The perfection of a concentrated, refined serum which will prevent distemper in dogs, when the living virus described by Carré is injected simultaneously on opposite sides, is announced by the authors.

Clinical and laboratory studies of the simultaneous use of serum concentrate (Little) and living virus for immunizing dogs against distemper, M. L. MORRIS (*North Amer. Vet.*, 15 (1934), No. 8, pp. 32-37).—In the work here reported the serum concentrate described by Little and Lentz, as above noted, when administered in 4 cc doses, was capable of controlling any one of the three viruses tested. It was found that the blood picture of dogs injected with serum and virus will detect changes not clinically visible. It may, therefore, be of value in the standardization of serum.

The effect of ultraviolet radiation on the ova of the ascarid roundworms *Toxocara canis* and *Toxascaris leonina*, W. H. WRIGHT and E. D. McALISTER (*Smithsn. Misc. Collect.*, 93 (1934), No. 1, pp. 13).—In this contribution a study is reported of the action of ultraviolet light on the ova of the two species of ascarids commonly infesting the dog. A list is given of 17 references to the literature.

Feline infectious enteritis, E. E. LEASURE, H. F. LIENHARDT, and F. R. TABERNER (*North Amer. Vet.*, 15 (1934), No. 7, pp. 30-44, figs. 6).—This contribution on a disease of cats due to a filtrable virus is presented with a list of 16 references to the literature.

The hydrogen-ion concentration of the digestive tract of the fowl, R. L. MAYHEW (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 2, pp. 148-152).—Contributing from the Louisiana Experiment Station, data are presented on the H-ion concentration of the various regions of the digestive tract of the fowl, including 5 male and 5 female adults, 7 birds 10 to 11 weeks old, and 7 that were 13 to 17 weeks old.

"The digestive tract was found to be, in general, fairly acid, averaging approximately 5.0 in the crop and decreasing to the neutral point in the region of the ceca. The ceca were found to average approximately neutral. The acidity of the posterior portion was much higher in the birds 10 to 11 weeks old than in the older individuals."

[Report of work in avian pathology, etc., at the Iowa Station] (*Iowa Sta. Rpt.* 1934, pp. 60, 61, 142, 143).—The work of the year briefly referred to (E. S. R., 71, p. 526) includes studies of so-called "range paralysis" in chickens, by C. Murray, C. D. Lee, F. D. Patterson, H. L. Wilcke, and E. W. Henderson; the influence of various nutritional factors on blindness and range paralysis in chickens, by Wilcke, Henderson, and Patterson; transmission of so-called range paralysis in chickens through the egg, by Murray, Lee, Patterson, and Wilcke; breeding for resistance to fowl typhoid in poultry, by W. V. Lambert and N. F. Waters; and genetic investigation of resistance and susceptibility to disease in laboratory animals, by Lambert.

Diseases of poultry—their nature and control, L. VAN ES and J. F. OLNEY (*Nebraska Sta. Bul.* 290 (1934), pp. 110, figs. 31).—This practical account of the diseases and parasites of poultry replaces Bulletin 195 (E. S. R., 50, p. 185).

The etiology of fowl paralysis, leucosis, and allied conditions, M. W. EMMEL (*Vet. Med.*, 30 (1935), No. 2, pp. 68-70).—In continuation of earlier work at the Florida Experiment Station (E. S. R., 71, p. 704), the author reports having been able to induce fowl paralysis and leucosis by means of certain members of the paratyphoid and typhoid groups of bacteria. In a series of experiments it was determined that enteritis in most instances is a necessary predisposing factor in that it furnishes an avenue of infection for the primary etiological agent.

It is concluded that the causative organism establishing itself in the intestinal tract gains entrance to the blood stream of the bird through an inflamed

intestinal mucosa. "Once in the blood stream the natural defenses of the bird are called into action in an effort to destroy the invading micro-organisms. This action gives rise to hemocytoblastosis, the predominating cell types depending upon the rate of entrance and number of organisms entering as well as the potency of the endotoxin contained within the causative organism. Endotoxin, which is an important constituent of the groups of organisms acting as the primary etiological agent, now becomes an important factor in the continuation of the process. Phagocytes destroy the invading bacteria, the endotoxin elaborated on the destruction of the bacterial cell in turn destroys the phagocyte. Endotoxin further inhibits agglutination, which results in delaying the phagocytic process, which may result in an increased number of phagocytes being called into action. If the organisms are too numerous to be destroyed by the phagocytes, the erythrocytes are attacked, resulting in a marked numerical decrease of these cells.

"In vitro 0.01 cc of endotoxin, 1 cc of which is capable of killing a 20-g mouse in 16 hr., retards agglutination in the highest agglutination titers of a positive serum in a standard tube agglutination test. Repeated injections of endotoxin of such potency that 1 cc would kill a 20-g mouse in 5 min. have failed to induce cases of fowl paralysis and leucosis. It is of more than passing interest, however, to note that the intravenous or intraperitoneal injection of such endotoxin into young chicks often causes typical but transient symptoms of paralysis.

"Only in exceptional cases during the entrance of the causative organisms into the blood stream can the organism be isolated from the tissues of the bird.

"Hemocytoblastosis once initiated, and we might say that we have never failed to initiate this process in any of our experimental birds by even extraordinary routes of infection, the process continues during the period of infection which roughly estimated may be as short as 5 days or as long as 15 to 20 days. The causative organism then completely disappears from the picture. All attempts to isolate it from the intestinal tract fail.

"Hemocytoblastosis, however, continues, the impetus now being due to an apparently new substance formed in the blood stream during the initial stages of this process. This new substance is apparently a product of the disintegrating blood cells. It is not known at this time whether endotoxin becomes a component part of this substance. That this new substance is toxic to blood cells cannot be questioned, as the destruction of blood cells continues with the bird attempting to compensate for this destruction by the formation of new blood cells. The hypothesis is advanced that this new substance is of such chemical structure that the normal physiological processes of the body find it difficult to eliminate. . . .

"We believe it is this toxic substance, which apparently is accumulative, that is responsible for the fact that fowl paralysis and leucosis are transmissible to healthy birds by means of tissue emulsions and filtrates of affected organs and which many investigators have regarded as a filtrable virus. . . .

"*Salmonella aertrycke* has been found to be the most common causative organism causing natural outbreaks of fowl paralysis and leucosis. To date we have been able to induce cases of these diseases with *S. schottmülleri*, *S. enteritidis*, *S. suipestifer*, and *S. typhimurium*."

The propagation of the virus of infectious laryngo-tracheitis on the chorio-allantoic membrane of the developing egg, F. M. BURNET (*Brit. Jour. Expt. Path.*, 15 (1934), No. 1, pp. 52-55, pl. 1).—The author has found that the virus of laryngotracheitis may be propagated in the chorioallantoic membrane of the developing egg. The lesions produced in the membrane are

primarily due to proliferative and necrotic changes in the ectodermal layer; proliferating cells frequently show typical intranuclear inclusions similar to those found in the tracheal lesions.

The differentiation of the viruses of fowl plague and Newcastle disease: Experiments using the technique of chorio-allantoic membrane inoculation of the developing egg, F. M. BURNET and J. D. FERRY (*Brit. Jour. Expt. Path.*, 15 (1934), No. 1, pp. 56-64, pl. 1).—The authors have found the viruses of Newcastle disease and fowl plague to be highly infective for the developing egg and the use of the technic reported to offer a number of advantages. The virus of Newcastle disease produces a characteristic lesion in the chorioallantoic membrane, in which cytoplasmic inclusions can be demonstrated histologically. Comparative filtration studies with egg material indicate that the virus is larger (from 80 to 120 $m\mu$) than the virus of fowl plague (from 60 to 90 $m\mu$). The virus of Newcastle disease is more resistant to photodynamic inactivation by methylene blue than fowl plague virus. These differences in conjunction with the known clinical and immunologic differences point to the complete etiologic independence of the two diseases.

Economic importance of losses from avian tuberculosis in the Middle West, H. R. SMITH (*U. S. Egg and Poultry Mag.*, 41 (1935), No. 2, pp. 26, 27, 54, 56, 58, fig. 1).—A practical discussion of the avian tuberculosis problem in the Middle West, presented by a member of the National Livestock Commission.

Spontaneous paratyphoid infection of canaries by a bacterium of the Breslau or Aertryck type: Experimental vaccination by ingestion [trans. title], C. CERNAIANU (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 18, pp. 262-264).—The paratyphoid of canaries studied by the author was due to the *Salmonella enteritidis* type Breslau or *S. aertrycke* and is transmissible to small passerine songbirds as the goldfinch and chaffinch. It was found that vaccination by ingestion with an autogenous vaccine may give quite satisfactory results.

New studies of pigeon paratyphoid: Experimental vaccination amidst highly infected surroundings [trans. title], C. CERNAIANU (*Compt. Rend. Soc. Biol. [Paris]*, 116 (1934), No. 18, pp. 264-266).—In continuation of earlier studies (E. S. R., 69, p. 582), the author reports having found paratyphoid of the pigeon caused by *Salmonella aertrycke* or *S. enteritidis* type Breslau to be the most fatal of the diseases of young pigeons and also of adults. Vaccination even in a highly infected pidgeonry, chiefly with an autogenous vaccine, gave quite satisfactory results and confirmed the earlier findings.

Pigeon paratyphoid, Z. MORCOS (*Vet. Jour.*, 91 (1935), No. 1, pp. 11-15).—Contributing from Cairo, Egypt, the author reports paratyphoid of pigeons to be a source of serious loss. Rabbits, rats, and mice are susceptible; guinea pigs are refractory; and fowls and sparrows resist the infection. Killed cultures in two successive doses were found to be protective.

Relative efficiency of vermifuges for poultry (*Arkansas Sta. Bul.* 312 (1934), pp. 33, 34).—The work briefly referred to includes that to determine the efficiency of turpentine and oil, by W. L. Bleecker, and the efficiency of various vermifuges when tested under field conditions and control work with coccidiosis, both by Bleecker and R. M. Smith.

On the disinfection of poultry-houses by means of fire-guns, H. J. STAFSETH and F. CAMARGO (*Jour. Amer. Vet. Med. Assoc.*, 86 (1935), No. 2, pp. 162-166).—In testing the value of the so-called "fire gun" as a means of disinfection of poultry houses, it was found that colon bacilli, staphylococci, and streptococci repeatedly survived an exposure of 15 sec. to the flame. *Salmonella pullorum* in artificially infected droppings was recovered after exposures of

2.5, 10, and 15 sec. The authors conclude that disinfection of poultry houses in this way is impracticable and very inefficient.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations at the Arkansas Station**], D. G. CARTER, J. B. WOODS, and R. M. SMITH (*Arkansas Sta. Bul. 312 (1934), pp. 9, 10*).—The progress results are briefly presented of investigations on preservative treatments for fence post wood, water cooling of milk, and effect of poultry housing factors on egg production.

[**Agricultural engineering investigations at the Colorado Station**] (*Colorado Sta. Rpt. 1934, pp. 16, 17, 23, 24*).—The progress results are briefly reported of tests by D. A. Wigle on evaporation of road oils in aggregates, and of investigations on measurement of irrigation water.

[**Agricultural engineering investigations at the Iowa Station**] (*Iowa Sta. Rpt. 1934, pp. 37-43, figs. 2*).—The progress results are briefly presented of an economic and engineering study of corn production methods in Iowa conducted by J. B. Davidson, E. V. Collins, and W. G. Murray in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, and of investigations by H. Giese on farm building losses due to wind and fire, by Collins on the use of tractors, by Davidson and Collins on tractor wheel efficiency, by Collins on the development of equipment for checkrowing beets, by Davidson on harvesting alfalfa with the windrow pick-up baler, and by Collins on the development of a new type of terracing machine.

[**Agricultural engineering investigations by the Nebraska Station**] (*Nebraska Sta. Rpt. [1933], p. 6*).—The progress results are briefly reported of studies of methods of cooling milk on farms and their effect on quality, and the adaptation of pneumatic tires to farm tractors.

[**Agricultural engineering investigations by the Cornell Station**] (*[New York] Cornell Sta. Rpt. 1934, pp. 61, 62*).—The progress results are briefly presented of investigations on poultry house ventilation by F. L. Fairbanks, H. E. Botsford, et al., electric brooding of chicks by J. E. Rice and Fairbanks, and design and construction of a fruit washer by B. A. Jennings.

[**Agricultural engineering investigations at the Pennsylvania Station**], A. W. CLYDE, R. U. BLASINGAME, and J. E. NICHOLAS (*Pennsylvania Sta. Bul. 308 (1934), pp. 9, 10, fig. 1*).—The progress results are briefly presented of investigations on potato harvester development and on dairy sterilizers.

The loss of head in cast-iron tees, F. E. GIESECKE, W. H. BADGETT, and J. R. D. EDDY (*Tex. Engin. Expt. Sta. Bul. 41 (1932), pp. 38, figs. 32*).—Studies are reported, the purpose of which was to determine the loss of head with water at 70° F. flowing through standard cast-iron tees. The investigation included all possible combinations of flow in $\frac{3}{4}$ -in., 1-in., and $1\frac{1}{2}$ -in. standard cast-iron tees and in $1\frac{1}{2}$ by $1\frac{1}{4}$ by 1 in. standard cast-iron tees.

It was found that the loss of head in cast-iron tees is a function of the percentage of water diverted at right angles in the tee.

For practical applications the loss of head in cast-iron tees for the diverted portion of the stream, when expressed in equivalent elbows, may be calculated by the equation

$$E_e = 0.75 \left(\frac{v_1^2 + v_2^2}{v_2^2} \right)$$

where E_e is the loss of head in equivalent elbows, v_1 is the velocity of the combined stream, and v_2 is the velocity in the portion of the stream diverted at right angles for which the loss of head is to be determined.

In most cases, for all practical purposes, the loss of head for the portion of water flowing straight through the run of the tee may be neglected.

A quantitative study of certain factors affecting soil- and water-losses as the logical basis for developing practical methods of erosion control, G. W. MUSGRAVE (*Amer. Geophys. Union Trans.*, 15 (1934), pt. 2, pp. 515-521).—In a contribution from the U. S. D. A. Bureau of Chemistry and Soils, data are presented which were obtained from experiments at the Clarinda (Mo.) Soil Erosion Station on Marshall silt loam soil, which is extensive and typical of the soils of the Missouri Valley.

Results indicate that the primary factors determining the design of erosion control measures are those affecting (1) the infiltration capacity of the soil, (2) the capacity of the surface storage reservoir, and (3) the group of factors affecting the density of the run-off material. While the infiltration capacity is largely determined by the inherent qualities of the soil, definite improvement may be effected, for example, by incorporation of organic matter, by attention to the character and condition of the vegetative cover, etc. The capacity of the surface storage reservoir may be modified within limits by tillage practices and by terracing. An extremely potent factor affecting the density of run-off is the type of vegetative cover. The density of run-off in turn is a most potent factor in determining the total amount of erosion. All of these factors may be quantitatively determined and from such information the basis laid for a sound system of erosion control under field conditions.

Stop gullies—save your farm, W. R. MATTOON (*U. S. Dept. Agr., Farmers' Bul.* 1737 (1934), pp. 11+14, figs. 12).—Comprised largely of illustrative material, this is designed to suggest effective and practical ways and means of checking gullies by establishing stands of trees, vines, and grasses as protective soil covers. The necessary steps in stopping gullies are said to be (1) construction of temporary check dams, (2) grading of abrupt banks to an angle of 30 percent or less, (3) planting of soil-retaining vegetation, and (4) protection of the vegetation from fire, livestock, and overcutting.

Compressibility and elasticity of soils indicated by flocculation constants, C. A. HOGENTOGLEE (*Pub. Works*, 65 (1934), No. 9, pp. 16-18, figs. 7).—In a contribution from the U. S. D. A. Bureau of Public Roads the results of studies are summarized which indicate that compressibility is the property which causes soils to deform vertically under load in proportion to the decrease in the air or moisture content. A compressible soil does not displace laterally, and the deformations are more or less permanent. Elastic soils, on the other hand, are difficult to compact and rebound upon the removal of the load. They cannot be permanently compacted by rolling or other temporary application of the load.

The total range in density combined with the density at particularly selected degrees of consolidation, shrinkage, and swell indicate the extent to which the soils have the properties which control deformation. Consequently such densities are the basis of soil identification by means of physical tests.

The flocculation test is used as a means of measuring the physical tendencies of soils, such as cohesion, adhesion, drainage, and the like. This test consists of determining the porosity of soil samples in the dried and powdered state and at maximum water capacity in both the flocculated and deflocculated states.

The distribution of soil pressure beneath a footing, F. E. GIESECKE, W. H. BADGETT, and J. R. D. EDDY (*Tex. Engin. Expt. Sta. Bul.* 43 (1934), pp. 15, figs. 8).—The results of observations of soil pressure distribution beneath a column footing of reinforced concrete 19 ft. square and 2.5 ft. thick are presented. The soil beneath the footing is a clay with small and varying amounts

of sand and coarse material. Under certain moisture conditions the soil will change to a very plastic or semiliquid state and work up into open joints in foundations. Upon drying, the soil shrinks materially. In field tests the soil appeared to have considerable elasticity.

Laboratory tests of the soil showed that when the moisture content was 60 percent or more a pressure of 300 lb. per square foot caused free liquid to appear on the surface of the soil within 18 hr. after application of the pressure.

The largest load was indicated at the center of the footing until the building above was practically completed when there was a gradual shifting of the maximum load toward one side. It appears that the pressure under the footing was never symmetrical about the column axis.

The practical problems of corrosion.—VIII, The inhibitive action of certain pigments on rusting, K. G. LEWIS and U. R. EVANS (*Jour. Soc. Chem. Indus., Trans.*, 53 (1934), No. 4, pp. 25T–33T).—The results of a series of studies in England (E. S. R., 68, p. 680) are reported. These related to the effect of commercial pigments in tubes containing air and of pure chemicals in tubes containing oxygen. Data were obtained on the effect of pigment in a paint coat scratched locally.

It was found that paints can protect either by mechanically excluding corroding influences or by chemically inhibiting the corrosion reaction. The results indicate that the inhibitive action of pigments rests on the same principles as inhibition by soluble chemicals used in water treatment. When the products of incipient corrosion are precipitated in physical contact with the metal the attack stifles itself and the metal remains immune.

A comparative study of pneumatic tires and steel wheels on farm tractors, C. W. SMITH and L. W. HURLEUT (*Nebraska Sta. Bul.* 291 (1934), pp. 40, figs. 24).—Several phases of experimental work on the subject are reported, including farm operation and tire-inflation pressure tests, tests of weight transfer and travel reduction and of wheel efficiencies, tests of the effect of adding weight on the traction of pneumatic tires, and a comparison of tests on a stubble field and a tractor testing course.

In the farm operation test it was found that a rubber-tired tractor is harder to hold on listed corn ridges when cultivating the first time over than a tractor equipped with steel wheels and spade lugs. The difference is less noticeable if the front tires are inflated to 25 lb. or higher and if the installation of the rear rubber-tired wheels has not changed the tread of the tractor. There was little difference in the ease of handling or of riding qualities between tractors equipped with rubber tires and those equipped with steel wheels when cultivating corn, except in handling when on the ridges. The riding qualities of a tractor equipped with rubber tires are very much better than those of one equipped with steel wheels and lugs when going to and from fields and when traveling on the road. The rubber-tired tractor is considerably better all around for haying operations than the tractor equipped with steel wheels and spade lugs. It does not punch hay into the ground. It does not tear up the ground when approaching the stacker with a sweep. In general, the riding qualities of the rubber-tired tractor are much better on a meadow, but on meadows that are very rough an oscillating, bouncing motion is given to the rubber-tired tractor that not only affects the driver, but, when mowing, is reflected in a rough job due to the up-and-down movement of the sickle bar. A rubber-tired tractor has less traction on firm soil than a tractor with steel wheels and spade lugs, but in loose, sandy soil it has more.

A saving in time and fuel can be made on most farm operations by using a tractor equipped with pneumatic tires. This saving becomes less significant,

and may become negative as drawbar pulls increase, necessitating low gear. This saving increases for those operations which make a relatively light load and permit the use of higher gears. Necessarily the tractors best adapted to rubber tires are those having sufficient speeds to utilize this advantage. Front-tire inflation pressures as low as 15 lb. were found to be unsatisfactory; 26 lb. inflation for front tires proved very satisfactory. It would seem that the design of a tread on a front tire should be different from that on a rear tire to correspond with the difference in duty of the two.

Field conditions were encountered following rains that caused a tractor equipped with pneumatic tires to slip when pulling a combine and also when pulling a plow. Although steel wheels and lugs gave some trouble under the same circumstances, they were more satisfactory than the rubber tires. In applying rubber tires to tractors it was necessary in some instances to widen the tread (the distance from the center of one rear tire to the center of the other). This handicapped the rubber tires when comparing them with steel wheels in some row-crop operations. Brakes on tractors need to be improved if rubber tires are used. This is made necessary by the increased road speeds and the tendency of a rubber-tired tractor to coast at the ends of rows after implements have been raised.

The inflation tests showed that changing the inflation pressure carried in tractor tires causes no appreciable change in the fuel consumption of the tractors on which the tires are used. Increasing tire inflation pressure causes an increase in speed of the tractor on which the pneumatic tires are used. Travel reduction is less for a tractor equipped with pneumatic tires when the tires are inflated to 16 lb. pressure than when inflated to lower pressures, and this difference increases as the maximum drawbar pull is approached. For the conditions of these tests, greater drawbar pulls were obtained with an inflation pressure of 16 lb. than with lower inflation pressures. The most horsepower was developed when the pneumatic tires were inflated to 16 lb. pressure.

In no case calculated did the weight transfer account for more than 0.5 percent of the travel reduction. Travel reduction, for all practical purposes, can be considered slippage, as computations for the same tractor show that if the entire weight on the front wheels of this tractor were transferred to the rear wheels it could not cause a reduction in travel of more than 2.5 percent.

From tire-deflection data taken from an isolated wheel and tire of different make from those used on the tractor to secure the weight-transfer data but of the same size, theoretical calculations showed that by adding weight equal to the front end of this tractor to the rear tires the percentage of travel reduction caused would be 3.98 percent. While these two percentages are not in very close agreement, they do emphasize the fact that weight transfer can account for only a small part of the travel reduction experienced with pneumatic tires.

In the wheel-efficiency tests it was found that under favorable operating conditions pneumatic-tired wheels transform a greater proportion of engine horsepower into drawbar horsepower than do steel wheels and spade lugs. Under favorable conditions steel wheels and spade lugs attain a greater drawbar pull in low gear than can be attained with rubber tires. There are two ways of increasing the drawbar horsepower of a tractor—by increasing the drawbar pull and by increasing the speed of travel. The drawbar pull of pneumatic tires is limited by traction in the first three gears. The drawbar pull of a steel-wheeled tractor is usually limited by engine horsepower in any gear.

The maximum drawbar horsepower of a rubber-tired tractor in various gears covers a much wider range of values than that of a steel wheel and lug tractor.

Horsepower values for rubber tires at high speeds exceed any derived for steel wheels and lugs. At low speeds the horsepower for rubber tires is less than that for steel wheels and lugs. Maximum economy was secured for the rubber-tired tractor when the drawbar pull was slightly more than 50 percent of the static weight of the rear of the tractor. Maximum drawbar horsepower values were secured for the rubber-tired tractor when the travel reduction was about 16 percent. No such point is found for steel wheels and lugs. The percentage of travel reduction is less for steel wheels and lugs than for rubber tires, and decreases as speed increases.

The traction of a pneumatic-tired tractor, that is, the pounds of pull at the drawbar, can be increased by adding weight to the rear of the tractor. This weight is usually added to the hubs of the drive wheels. The increased drawbar pull will be slightly more than 50 percent of the weight added to the wheels.

The stubble field and tractor testing course comparison showed that for at least one field condition the tires did as well on the tractor testing course as they could do under this field condition, in fact, just a little better. On the other hand, it is evident that where a tractor equipped with steel wheels and lugs on good footing in low gear will pull more pounds than the same equipped with rubber tires, this difference is considerably less under field conditions, and observations under other field conditions indicate that there are places where the rubber tires will actually pull as much as the steel wheels and lugs and more.

Some effects of diameter on the performance of tractor drivewheels, E. G. MCKIBBEN (*Agr. Engin.*, 15 (1934), No. 12, pp. 419-423, figs. 17).—Studies conducted at the Iowa Experiment Station are reported in which wheels were used having diameters varying from 38 to 58 in.

On the less firm soil conditions there was a very important variation in performance of the wheels investigated. There was a definite indication of the effect of water content of the soil on wheel performance. The percentage of soil moisture for the maximum traction was apparently higher than that for the highest efficiency.

The conclusion was drawn that the soil is the most difficult variable to control when making traction trials. The effective no-load rolling diameter increased as the firmness of the soil increased. The increase of effective no-load rolling diameter over rim diameter was greater for the smaller wheels on firm soil and for the larger wheels on loose soil. There was marked improvement in performance from the smallest to the largest wheels on the pulverated soil and on oat stubble. This was particularly true of the over-all efficiency. On the relatively firm sod the differences in soil conditions were more important than the variations in wheel diameter. There was some indication of the desirability of placing lugs as far apart as possible. The difference in rolling resistance between the smallest and the largest wheels on loose soil was 95 lb. for bare wheels and 164 lb. when equipped with 4-in. lugs, and on oat stubble 53 lb. for bare wheels and 113 lb. when equipped with 4-in. lugs. Adding 4-in. lugs increased the rolling resistance of the 38-in. wheels more on oat stubble than on loose soil. There was no indication of materially increased resistance to turning except on sod. The larger wheels showed an advantage from the standpoint of decreased tangential input force required to go over a given obstruction. The larger the wheels the smaller was the obstruction which could be passed over without destroying the stability of the tractor.

Tractive resistance as related to roadway surfaces and motor vehicle operation, R. G. PAUSTIAN (*Iowa Engin. Expt. Sta. Bul.* 119 (1934), pp. 64, figs. 36).—In this publication an analysis is presented of motor vehicle tractive resistance and air resistance. The relative merits of towing, decelerating, coast-

ing, and direct methods of measuring tractive resistance are discussed, followed by a complete description of the gas-electric drive test car used in the investigation.

Data from road tests also are presented showing the effect of road surfaces on power requirements, gasoline consumption, and tractive resistance. The data show that the relative efficiencies of road surfaces vary widely. No one class of surfaces is stated to have either a high, average, or low efficiency because of the effect of differences in the surface condition. An outstanding finding was that constant throttle opening is accompanied by constant power output, regardless of the road profile.

Tests on Dunlop pneumatic equipment for farm carts, season 1933-34. W. SAYER (*Agr. and Livestock in India*, 4 (1934), No. 5, pp. 524-533, pls. 16, fig. 1).—Tests conducted at the Pusa Research Institute of four sets of wheels, tires, hubs, and axles are reported. The equipment was tested throughout a complete cane carting season.

The tests showed that the loads which could be drawn over the same surface were much heavier with pneumatic wheel equipment than those which could be drawn in the ordinary farm cart. The power requirement also was less per unit of load. It appears that the use of pneumatic wheel equipment will cheapen cartage costs on cane.

A technical analysis of the agricultural implement type of spoked wheels. O. B. ZIMMERMAN (*Agr. Engin.*, 15 (1934), No. 8, pp. 287-301, figs. 48).—This is a complex mathematical and mechanical analysis of the spoked type of wheel used in farm machinery, with particular reference to the distribution of stresses resulting from vertical load, sidethrust, torsion, and pivoting. These coplanar stresses are developed into space relationships and are followed by modification from radial spokes to other forms. The results of tests of more than 1,500 wheels also are presented to bear out the technical results.

The adjustment and repair of grain binders. M. A. SHARP and B. T. VIRTUE (*Iowa State Col. Ext. Circ.* 209 (1934), pp. 16, figs. 7).—Practical information is given on the subject.

A low-cutting sled corn cutter. O. K. HEDDEN (*U. S. Dept. Agr., Misc. Pub.* 212 (1934), pp. 10, figs. 16).—A low-cutting sled corn cutter is described which was devised to reduce the labor of gathering the stalks for ensiling or other use where the use of a binder is not practicable. A bill of materials required to construct a 2-row cutter of this type is included.

Use of electricity on Nebraska farms, 1920-1934. E. E. BRACKETT and E. B. LEWIS (*Nebraska Sta. Bul.* 289 (1934), pp. 47, figs. 36).—A report is presented of investigations of the use of electricity on Nebraska farms over a 12-yr. period. Over 60 different uses for electricity were found, of which 40 were fairly common.

The principal uses other than for lighting were for refrigeration, pumping water, laundering, radio operation, cooking, dairy practices, irrigation pumping, feed processing, poultry equipment operation, hay hoisting, grain elevating, cold storage, water heating, soil heating, animal clipping, and general motor belt work.

Data on distribution of usage in amount and time indicate no very abrupt change in the amount of electrical energy used by average Nebraska farmers either month by month or season by season. It also appears that where the investment could be undertaken for the wiring installations and the necessary appliances and equipment, enough energy was consumed to make these farmers good patrons to distributing systems. A few feeders and dairymen in

the State use 800 to 1,500 kw.-hr. per month regularly, but the number of these specialists is small in comparison with others using rural electric service.

Data on electric refrigeration in rural homes indicate that 0.25 kw.-hr. per day per cubic foot of storage should be about the maximum average energy consumption under heavy farm usage during the summer months.

Electrical energy requirements for washing the clothes of the average family of 5 to 6 persons vary from 2 to 4 kw.-hr. per month, with the average about 2.5. With careful operation the improved washing machine can be relied upon to use less than 2.5 kw.-hr. per month if the family is no larger than 6 persons.

It was found that the ironing machine completed the ironing of the same size and type of washing in less than one-half the time required by the electric hand iron. The electric energy required was less in some instances for the ironing machine than for the hand iron. It was also found that the ironing required 6 to 20 kw.-hr. per family per month, or 1 to 3 kw.-hr. per person per month, with an average of about 1.5 kw.-hr. per person per month. These data held for both the machine and the hand iron, with a possible slight advantage for the machine.

The energy consumption of the electric range as used in Nebraska varies from 25 to 50 kw.-hr. per person per month, with an average of about 30. This energy consumption is influenced by the type of cooking, the training and carefulness of the operator, and the quality and adaptability of the electric range.

The consumption of electrical energy about the dairy farm, whether large or small, is distributed evenly over the different months of the year and the hours of the day in such manner that practically all the electrical distributing agencies in Nebraska are glad to make extra effort to give that service. The uses to which the dairyman or even the farmer who milks several cows as a side line can put electrical equipment are of such nature that benefits can be readily seen.

An appendix lists manufacturers cooperating in the study.

Electric soil heating. J. W. TOMLINSON (*Bul. Hydro-Elect. Power Comm. Ontario, 21 (1934), No. 10, pp. 339-350, figs. 4*).—A large amount of information from a Canadian source is presented on electric soil heating, including data from test results in both hotbeds and coldframes and in the greenhouse. It is stated that repeated tests during the winter and spring have shown that surface heating is entirely practical in hotbeds and coldframes. By applying the heat directly at the point where it is most needed, power consumption has been reduced and the need for special insulation and expensive construction obviated.

It is concluded that any hotbed which is well drained, protected from winds, and free from cracks and openings may be made into a satisfactory electric hotbed by laying electrical soil-heating cable on the soil surface at the time the seeds are planted. Plants grew in contact with the heating cables without injury. The lead-covered element seems to be reliable, flexible, and durable, and its heat flux of 5.7 w per lineal foot is ideal where 100 w per square yard are used. One of the methods of saving power in any type of electrically heated hotbed is to cover the beds at night. It is pointed out that further information is needed on the proper soil and air temperatures required for various plants at various stages of growth and on the proper electric capacity to maintain good growing conditions under different weather conditions.

Utilization of low grade fuels, coke oven and tar oil wastes. C. A. BASORE (*Ala. Engin. Expt. Sta. Bul. 5 (1934), pp. [4]+40*).—This publication presents a discussion of newer methods for concentrating and utilizing low grade and waste coals, lignite, and peat. Information also is presented on the

utilization of wastes relative to the coking of coals and the refining of coal tar oils. A complete bibliography containing a large number of references is included.

Government tests distillate burners, A. H. SENNER (*Fuel Oil Jour.*, 13 (1934), Nos. 5, pp. 46, 47, 49, 50, figs. 13; 6, pp. 45, 46, 51, 52).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, a series of tests are reported which constitute part of the information available on distillate oil burners. These burners were tested in a coal-burning range, and the range itself was tested with coal to provide a basis for comparison with the results obtained when fired by the several range burners under investigation. A large amount of data are presented but no definite conclusions are drawn.

Temporary silos, E. N. SHULTZ and B. T. VIRTUE (*Iowa State Col. Ext. Bul.* 202 (1934), pp. 16, figs. 13).—Practical information is given regarding the construction and adaptation of trench, corn cribbing, snow fencing, corn bundle, and other types of temporary silos.

AGRICULTURAL ECONOMICS

[Papers presented at the twenty-fourth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ.*, 16 (1934), Nos. 2, pp. 189–218, 233–257, 265–320, figs. 3; 3, pp. 444–480; 4, pp. 689–709).—The following papers and discussions thereon, in addition to those previously noted (E. S. R., 71, p. 262), are included: Relating Research in Agricultural Economics to Other Fields of Agricultural Science, by P. V. Cardon (pp. 189–199); Reorienting Research in Agricultural Economics, by E. G. Nourse (pp. 200–218); Margins in Marketing, by F. V. Waugh (pp. 233–247); Consumer Grades and Standards, by W. C. Waite (pp. 248–254); Research in Physical Organization of Marketing, by W. P. Hedden (pp. 255–257); The Influence of Recent and Pending Developments on Rural Life and Culture in the United States, by E. deS. Brunner (pp. 265–275); Handling Delinquent Farm Mortgages without Foreclosure, by H. C. M. Case (pp. 276–286); Legislative Approaches to Farm Debt Problems, by F. F. Hill (pp. 287–290); Report of the Committee on Rural Appraising of the National Joint Committee on Rural Credits, by D. H. Doane (pp. 291, 292); History of Farm Debt Adjustment Activities, by J. I. Falconer (pp. 293–297); Research Relating to Policies for Submarginal Areas, by L. C. Gray (pp. 298–303); Some Types of Economic Research in Relation to Land-Use Planning, by C. F. Clayton (pp. 304–309); Research Needed as Guidance to the Subsistence Homesteads Program, by C. C. Taylor (pp. 310–314); The Informational and Analytical Basis for Regional Planning, by J. Crane (pp. 315–320); The Administrative Use of Agricultural Census and Intercensal Data, by H. R. Tolley and J. D. Black (pp. 444–450); The Coming Agricultural Census Enumerations, by J. D. Black (pp. 451–458); Agricultural Statistics Viewed in the Light of a Changing Agricultural Program, by M. R. Benedict (pp. 459–470); Some Needed Developments in Scope and Timing of Agricultural Statistics, by C. M. Purves and O. C. Stine (pp. 471–480); The Relationship between the Agricultural Adjustment Administration and Agricultural Economics Extension Work in the South, by J. F. Criswell (pp. 689–693); Economics Extension and the Agricultural Adjustment Administration, by H. M. Dixon (pp. 694–697); Extension Work in Marketing in Periods of Price Maladjustment and Governmental Intervention, by M. C. Bond (pp. 698–704); and The Course of Outlook Extension, by D. C. Wood (pp. 705–709).

[Investigations in agricultural economics] (*Jour. Farm Econ.*, 16 (1934), Nos. 2, pp. 321–340; 3, pp. 525–543; 4, pp. 710–726).—Notes are included on the

following investigations and subjects: New Chinese Agricultural Statistics, by M. K. Bennett (pp. 321-325); Germany Adopts New Land Ownership Law, by D. F. Christy and G. P. Boals (pp. 326-329); Method of Determining Size of Sample for the Cotton Grade and Staple Reports, by W. B. Lanham and F. H. Harper (pp. 329-333); A Weighted Crop Index, by P. I. Wrigley (pp. 333-336); Undergraduate Preparation for a Graduate Major in Agricultural Economics, by G. S. Wehrwein et al. (pp. 336-338); The Effect of the Feed-Egg Ratio on Numbers of Young Chickens in Farm Flocks on June 1, by G. W. Sprague (pp. 338-340); Some Observations on the Seasonal Variation of Monthly Farm Income Estimates, by C. M. Purves (pp. 525, 526); Relationship between Farmers' Labor Return from an Enterprise and Changes in the Size of the Enterprise, by M. Clawson (pp. 526-529); Variance Analysis of Variability in Paired and Replicate Series of Staple-Length Observations on Cotton Samples, by F. H. Harper, W. B. Lanham, and O. T. Weaver (pp. 529, 530); Possibilities and Limitations of Subsistence Homesteads, by L. B. Tate (pp. 530-533); Measurement of Average Differences between Paired Observations on Staple-Length of Cotton Samples, by O. T. Weaver, W. B. Lanham, and F. H. Harper (pp. 534, 535); Effect of an Increase in Population on the Shape of the Demand Curve, by L. J. Steck (p. 535); County Consolidation in Colorado, by S. R. Heckart (pp. 535-539); Technical Reconstruction and the Growth of Production in the Agriculture of the USSR, by P. I. Liastchenko (pp. 539-543); Some Economic Effects of the Back-to-the-Land Movement in Marginal Farming Areas of Southern Indiana, by G. E. Young (pp. 710, 711); Size of Farm and the Business Cycle, by J. A. Hodges (pp. 711-714); Factors Related to Farm Tenancy in North Carolina, by C. H. Hamilton and R. M. Williams (pp. 714-716); The Effect of Certain Adjustments in Stocks Reports upon Estimates of Annual Consumption of Burley Tobacco, by D. G. Card (pp. 716-719); A Basis of Farm Inventory Values for Farm Organization and Efficiency Studies, by G. A. Pond and W. P. Ranney (pp. 719-723); Economic Readjustments in the Dairy Area in Delaware, by R. O. Bausman (pp. 723-725); and Bibliography of Agricultural Economic Literature, by A. M. Hannay (pp. 725, 726).

[Investigations in agricultural economics at the Colorado Station, 1933-34] (*Colorado Sta. Rpt. 1934*, pp. 14-16).—Brief statements are given as to investigations on farm organization and management in the Greeley area, costs and methods of cattle and sheep production on the range, land utilization in northwestern Colorado, and major types of cooperative organization.

[Investigations in agricultural economics at the Iowa Station, 1933-34] (*Iowa Sta. Rpt. 1934*, pp. 10-25, 27, 28, 168, 169).—Results of investigations not previously noted are reported for the following: Elasticity of supply of corn and hogs for the different types of farming areas in Iowa, by T. W. Schultz and A. G. Black; packer demand for Iowa hogs, by P. L. Miller, I. W. Arthur, M. D. Helser, and F. J. Beard; detailed farm records and accounts for northwestern Iowa farms, by J. A. Hopkins, Jr., and Black; secular, annual, and seasonal movements in the price of cash corn, by G. S. Shepherd; Iowa farm land values, including a statistical procedure used in computing cash rentals and farm land values by counties, 1923-34, by M. Peck; place of pasture in Iowa farming types, by Hopkins, H. D. Hughes, C. L. Holmes, and E. B. Hurd; farm organization and management in southern Iowa with special emphasis on baby beef production, by Hopkins, C. C. Culbertson, H. R. Mel-drum, and R. Beresford; major and minor type of farming areas in Iowa, by W. G. Murray; application of simple farm records in farm management, by Hopkins; the agricultural and industrial utilization of corn, by Shepherd and J. H. Buchanan; and determination of a desirable cropping system and live-

stock program for each township of Iowa for the purpose of developing a land utilization policy for the State, by W. H. Stevenson et al.

[Investigations in farm management and agricultural economics by the Cornell Station, 1933-34] ([*New York*] *Cornell Sta. Rpt. 1934*, pp. 53-61).—Results of investigations not previously noted are reported on as follows: The average labor incomes on farms selling and not selling baby chicks for the year ended September 30, 1933, and on all farms for the years 1926 and 1929-33, found in a study of commercial poultry farms, by E. G. Misner and A. T. M. Lee; some findings as to methods of sales and relative prices of different varieties of apples, found in a study by P. S. Williamson of fruit-farm management in the Hudson Valley area; profits per acre from apples on different types of soils found in a study by G. P. Scoville and C. C. Spence of the relation of soil and cultural practices to the costs and returns in producing apples; the average uncollected taxes, 1928 and 1932, found by A. R. Barnett in a study of 250 towns; and the sources of farm credit, as shown by data collected by G. W. Hedlund from 483 farmers in 5 counties.

[Investigations in agricultural economics at the Pennsylvania Station, 1933-34] (*Pennsylvania Sta. Bul. 308 (1934)*, pp. 8, 9).—Included are some findings in studies of the factors affecting man-labor requirements for various farm enterprises, income from wool growing, and labor income in Centre County, by J. E. McCord; and a survey of fruit and marketing facilities in Reading and Wilkes-Barre, by J. R. Gauss.

[Investigations in agricultural economics by the South Carolina Station, 1933-34] (*South Carolina Sta. Rpt. 1934*, pp. 7-14, figs. 3).—The results of investigations not previously noted are reported on as follows: The findings regarding income-tax returns for 1932 under the project previously noted (E. S. R., 68, p. 546) are given by G. H. Aull; a chart based on a study by Aull and E. Riley of the relation between assessed and actual value of South Carolina farm real estate is included and discussed showing the average percentage deviation from the average ratio of assessed value to sales value of farms grouped in four groups on the basis of sale price; and a table by H. A. White and M. Guin continuing the study previously noted (E. S. R., 70, p. 120) shows the percentage distribution of staple length of American upland cotton ginned in South Carolina, crop 1932-33, and makes comparisons with the five preceding years.

[Farm economics in Great Britain] (*Farm Econ. [Oxford Univ.]*, 1 (1934), No. 8, pp. 153-180, figs. 3; 1 (1935), No. 9, pp. 181-196, figs. 2).—Included are articles as follows: Harvesting Costs on a South Midland Mechanised Farm in 1934, by J. R. Lee and S. J. Upfold (pp. 153-156); Semi-arable Sheep Farming in the Cotswolds, by J. R. Lee (pp. 156-159); Milk Production—Food Costs in Relation to Yield, by J. E. Blundell (pp. 160-162); Milk Producer-Retailers' profits, by A. L. Jolly (pp. 163-165); Collective Bargaining—The Case for an Independent Body, by H. Whitby (pp. 166-168); The Potato Situation, by R. L. Cohen (pp. 168-173); Changes in the Volume of Meat Imports, 1925-34, by K. A. H. Murray and R. L. Cohen (pp. 173-175); Mechanized Farms Survey—Some Preliminary Observations, by H. Whitby (pp. 181, 182); Grassland Management and Output on a Lancashire Farm, by J. Stewart (pp. 183, 184); The Certainty of Farming, by F. R. G. N. Sherrard (pp. 185, 186); Forecast of the 1935 Wheat Acreage, by R. McG. Carslaw and P. E. Graves (pp. 186-188); Egg Marketing in the North of England, by G. T. Roy (pp. 188-190); and Changes in the Volume of Food Imports Since 1931, by K. A. H. Murray (pp. 190-192).

The Program Planning Division of the Agricultural Adjustment Administration, H. R. TOLLEY (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 582-590).—The program of the Division is briefly described.

The California agricultural prorate act, H. E. ERDMAN (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 624-636).—The provisions of the act passed in 1933, the procedure in prorating a crop, and the prorating activities to date are described, and the probable future of the operation of the act and the conflicts of interest are discussed briefly.

Planned economy and agriculture, G. PAVLOVSKY ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 1, pp. 1-48).—The problems of planned economy, the present-day developments and tendencies in commercial policies of the countries of the world, and recent economic planning in agriculture, especially in the United States and Great Britain, are discussed.

Plan for the safeguarding of the national economy in the Argentine Republic ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 8, pp. 328-332).—A brief summary is made of the measures relating to the public debt and the control of farm product exchanges and a more detailed summary of the establishment of the Junta Reguladora de Granos for the regulations of the trade in grains. The plan for the protection of stock breeding is noted on page 859.

Agrarian reform in Bulgaria, Y. G. KOVATCHEFF ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 10, pp. 441-472).—The agrarian system and legislation before and after the liberation from Turkey and the legislation after the war and its application are described, and an estimation is made of the value of the reform legislation.

Measures for the rehabilitation of the agricultural industry in the Union of South Africa, C. HUBBACK ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 6, pp. 230-236).—The new legislation in 1933 and 1934 dealing with farm credit, drought relief, the improvement of natural conditions unfavorable to farming, and the improvement of the technical equipment of the farmer is briefly discussed.

Verification of tariff effectiveness by different statistical methods, R. R. RENNE (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 591-601).—A procedure for testing the efficiency of a tariff in raising prices of farm products is outlined and briefly discussed.

The Ottawa trade agreements, J. E. LATTIMER (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 565-581).—The conditions leading up to the Ottawa conference in 1932 and the conference and its actions are described. Its effects upon the trade of Canada and the United Kingdom and the future prospects are discussed briefly.

Agricultural marketing schemes in Great Britain ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 3, pp. 100-108).—The Agricultural Marketing Acts of 1931 and 1933 and the progress in applying them to different products are described briefly.

The competitive position of the Chicago market in the region of grain supply, E. A. DUDDY and D. A. REVZAN (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 637-661, figs. 5).—Using the monthly average prices, 1924-25 to 1931-32, of wheat, corn, and oats at Chicago, St. Louis, Omaha, Kansas City, and Minneapolis and the freight rate differences from points in the supplying territory to each market, maps were prepared showing the theoretical division of the territory between the markets for each grain. The areas of potential

competition thus determined for Chicago are checked against the actual areas of supply as determined for the crop years 1924-25 and 1925-26.

Regulation of the cereal market in Germany, H. BÖKER ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 8, pp. 342-346).—The operations under the law of September 26, 1933, for the maintenance of cereal prices is briefly discussed.

[The wheat trading commissions in Spain], E. MARTINEZ DE BUJANDA ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 10, pp. 472-477).—The purpose, constitution, and working of the commissions under the decree of July 1, 1934, are described.

Regulation of the marketing of dairy products and fats in Germany ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 5, pp. 198-205).—The new regulations since November 15, 1932, pertaining to the importation and marketing of butter, fats, and oils are discussed.

A survey of milk marketing schemes and price policies, R. L. COHEN (*Cambridge Univ. Dept. Agr., Farm Econ. Branch Rpt.*, 20 (1933), pp. 68, fig. 1).—"This study attempts to evaluate from the point of view of the community as a whole the price policies adopted by organized farmers for selling their milk in America and England." The factors preventing milk prices from being determined competitively, the ideal price policy for a cooperative association, price policies of existing American cooperatives for the marketing of milk, the basic surplus scheme, the contract scheme, transport and butterfat differentials, methods of paying the farmer adopted in England and Wales, and the price scheme proposed by the Reorganization Commission for Milk, 1933, are discussed. Appendixes show the statistical methods used in the determination of marginal returns when a basic quantity is established each year equal to a farmer's average production in the period of short production for the current and two preceding years, the contract scheme, determination of contract amount and marginal returns, and the relationship of marginal returns under the basic surplus and contract schemes.

A study of the reaction of individual milk producers of four Ohio markets from 1930 to 1933 to types of buying plans in use, R. W. SHERMAN (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul.* 76 (1935), pp. 23; *abs. in Ohio Sta. Bimo. Bul.* 172 (1935), pp. 25, 26).—This mimeographed bulletin reports the results of a study conducted by questionnaire sent producers in the market areas around Columbus, Canton, Dayton, and Cincinnati to ascertain their total milk sales and their reaction to the buying plans in use. The buying plans in the four areas are described, and tables are given and discussed showing the number of cows, sales and disposal of milk, and producers' statements as to the reasons for changes in test, 1930-33, changes in milk sales, in the amount of milk production, and in the dealers dealt with, the methods used to control the amount of fluid milk marketed, and the attitude of producers toward the basic surplus plans.

Some current problems in the Philadelphia milk market, T. K. COWDEN (*Pennsylvania Sta. Tech. Paper* 595 (1933), pp. [2]+32, figs. 4; *abs. in Pennsylvania Sta. Bul.* 308 (1934), p. 28).—"One of the chief purposes of this study was to get the opinions of the farmers concerning the milk marketing system in operation during March 1933 in the Philadelphia territory. Special attention was given to discovering outstanding reasons for a farmer's attitude toward his organization, the basic-surplus plan, and the health regulations." The attitude of farmers toward the basic-surplus and flat price plans, farmers' production, producers' knowledge of prices received and their reactions toward their organ-

ization, health regulations, the Dairy Council, ownership of country plants, and transportation rates are discussed, and some recommendations for the consideration of the Inter-State Milk Producers' Association are made.

The consumption of milk in Allegheny County, Pennsylvania, T. K. COWDEN and F. F. LININGER (*Pennsylvania Sta. Tech. Paper 569 (1932)*, pp. 12, fig. 1).—This is the first of a series dealing with factors affecting the consumption of milk in different localities of the State. It is based on the results of a survey made in September 1932. The per capita consumption and total use of milk, methods of sale of fluid milk and cream, number of dealers and their milk-handling capacity, and the relative amounts of milk handled by organized and unorganized dealers are discussed.

The distribution and consumption of milk in Allegheny County, Pennsylvania, T. K. COWDEN and C. G. GIFFORD (*Pennsylvania Sta. Tech. Paper 641 (1934)*, pp. [2]+16, fig. 1; *abs. in Pennsylvania Sta. Bul. 308 (1934)*, p. 29).—This paper reports the results of a study to determine the changes that had taken place from the previous study noted above to August 1933.

Distribution and consumption of milk in Reading, Pennsylvania, T. K. COWDEN (*Pennsylvania Sta. Tech. Paper 614 (1933)*, pp. [2]+14, figs. 2; *abs. in Pennsylvania Sta. Bul. 308 (1934)*, p. 29).—This is the second report of the series noted above and is based on data obtained in May 1933. The source of milk supply, number of dealers, forms in which milk was used, per capita consumption, units of sale, daily and seasonal variations in sales, percentages of fluid milk sold wholesale and retail, and the effect of beer sales on sales of milk by dealers and restaurants are discussed.

Distribution and consumption of milk in Williamsport, Pennsylvania, T. K. COWDEN (*Pennsylvania Sta. Tech. Paper 615 (1933)*, pp. [2]+13, figs. 2; *abs. in Pennsylvania Sta. Bul. 308 (1934)*, p. 29).—This is the third paper of the series noted above.

Local livestock markets in relation to Corn-Belt hog marketing, R. C. ASHBY (*Illinois Sta. Bul. 408 (1934)*, pp. 433-624, figs. 19; *abs. ed.*, pp. 20, figs. 12).—This bulletin analyzes the relations of local livestock markets to terminal markets and appraises the effects of local markets upon hog-marketing methods and hog prices. The reasons for local market development and the ownership, control, operating expense, volume of business, and buying practice of such markets are discussed. Analysis is made of the differences between terminal and local market prices of hogs in Illinois, the factors tending to narrow the differences, the frequency of daily differences, daily price fluctuations at local and terminal markets, factors influencing a local market operator's margin, and savings on freight possible on local market shipments.

Local and terminal marketing costs, the effects of in-transit privileges and discriminatory freight rates, inequalities in prices to packers, the effects of local markets on volume and quality of receipts of and buying competition at terminal markets, the advantages and disadvantages of local markets to stockmen, terminal markets as price-basing points for hog prices, supply and demand as determinants of such prices, and the depressing effects of local markets on terminal market prices are analyzed and discussed. The possible advantages and difficulties of management, evidences of services, and the objectives and possibilities of local cooperative marketing organizations are discussed. Suggestions and recommendations are made for solving the difficulties responsible for the existing demoralization of hog-marketing operations.

The number of local livestock markets in the Corn Belt increased rapidly in the decade ended 1932, when 250 or more such markets were in operation, of which the major percentage was privately operated. Price differences be-

tween local and terminal markets have tended to narrow, largely due to the decrease in truckage charges. The cancellation of in-transit freight privileges at terminal markets has made it possible for eastern packers to obtain Illinois hogs at from 2 to 20 ct. per 100 lb. less from local markets than from terminal markets. The extremely low freight rates on fresh meats from interior plants to Chicago and St. Louis (about 75 percent of the rates on live hogs) have made it almost impossible for packers on the terminal markets to buy Iowa hogs in competition with the interior packers. The operation of local markets has tended to lessen receipts and the proportion of top quality hogs on terminal markets and to reduce hog-buying competition on the terminal markets. Since local prices are based on terminal market prices, these effects have resulted in a weakening of the general level of hog prices on the local markets.

The advantages of local markets to individual stockmen are their more convenient location, prompt returns, a possible saving in marketing expense, and less hazard of price change while livestock are en route. The disadvantages are that payments for livestock are not guaranteed, a tendency to weaken hog prices, the fact that many local markets handle only hogs, less assurance of accurate weights and little opportunity for competitive sorting and grading, and the fact that the development of a surplus of local markets will increase marketing costs.

Some of the suggestions for solving the problem of the marketing situation are the reduction of terminal marketing expenses (1) by stockmen concentrating their consignments in the hands of the strongest sales agencies, thus reducing the number of agencies and making possible more effective and more economical service, (2) the reorganization by stockyards companies of their facilities on the basis of present-day receipts, releasing for other employment facilities not needed and thereby reducing overhead expense, and (3) the granting to all terminal markets in-transit rates with change of ownership.

Economic protection of stock breeding in Argentina ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 3, pp. 108-117).—The reasons leading up to the promulgation of the National Meat Law of October 7, 1933, the main provisions of the law, the constitution and working of the frigorificos and other commercial and industrial organizations, and the National Frigorifico are described.

Crops and markets, [December 1934] (*U. S. Dept. Agr., Crops and Markets*, 11 (1934), No. 12, pp. 457-536, figs. 3).—Included are tables, charts, reports, summaries, etc., of the usual types covering market reports and prices, and the final crop report for 1934 including tables (1), by States, of the estimated seeded acreage and condition of winter wheat and rye, 1932, 1933, and 1934, and the acreage of spring-sown crops, 1933 and 1934; (2) the acreage, production, prices received by farmers, and farm value of important crops, 1932, 1933, and 1934; (3) the acreage of different crops harvested and yields per acre and crop production, by years 1919-34; and (4), by States and by years, the acreage, yields, production, and farm value of different farm crops, 1932-34, and truck crops for market and for canning or manufacture, 1931-34. Other tables give data as to milk, cotton, poultry, hogs, farm employment, and mostly farm prices of different farm products, 1910-34.

[Crop and livestock statistics, Belle Fourche (S. Dak.) reclamation project] (*U. S. Dept. Agr., Tech. Bul.* 454 (1934), pp. 5-8, fig. 1).—Tables show, by years 1913-32, the acreage in different crops and the number of different kinds of livestock. Another table shows the annual shipments, 1916-32, of cattle, sheep, hogs, and horses from each of the five shipping points, and a

chart shows the average yield of sugar beets, 1912-32, grown at the station under different rotation systems.

Car-lot shipments and unloads of important fruits and vegetables for the calendar years 1931 and 1932 (*U. S. Dept. Agr., Statis. Bul. 46 (1934), pp. 203*).—This bulletin supplements the bulletin previously noted (*E. S. R.*, 68, p. 266) and shows the number of carloads of 41 fruits and vegetables shipped, by State of origin and by months, and the unloads of 19 of the commodities in 66 cities.

Monthly prices of selected California truck crops on the San Francisco, Oakland, Los Angeles, and New York City markets, 1910-1934, H. J. STOVER and A. W. STUART (*California Sta., 1934, pp. 57*).—This is a mimeographed preliminary report showing the monthly prices of selected California truck crops on the San Francisco, Oakland, Los Angeles, and New York City markets, 1910-34.

Farm value, gross income, and cash income from farm production, 1931-1932-1933 (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. [50]*).—Tables show for 1931, 1932, and 1933, by States, for different crops, livestock, and livestock and poultry products, the farm value of products, gross income, and net income. Benefit payments received for hogs in 1933 are included, but those for crops are not included.

Effects of the drought of 1934 on feed, forage, and livestock (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. [40], figs. 4*).—This mimeographed report discusses the findings in the special feed and livestock survey made by the Bureau of Agricultural Economics, the effects of the drought on livestock, the foreign livestock feed situation, and the prices of feed grains.

Index numbers of prices received by farmers for farm products, 1910 to 1934, as revised 1934, A. G. PETERSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp [2]+64+[1], pls. 10*).—This mimeographed revision includes 34 major farm products and 13 commercial truck crops. The method of making the revision and the changes in the products included and the index numbers are described. Tables, with few exceptions, show for the calendar years 1910-33 and by months for each year the index numbers (August 1909-July 1914=100) and such index numbers adjusted for seasonal variation for different groups of commodities and individual commodities. Other tables show the index numbers, by years, of prices paid by farmers for groups of commodities used in family maintenance and in production, and, by months January 1923 to September 1934, of prices paid and prices received.

Index numbers of prices paid by farmers for commodities bought, 1910-1934 (*U. S. Dept. Agr., Bur. Agr. Econ., 1933-34, pp. [1]+25*).—Tables are included in this mimeographed publication showing, by years 1910-33, and for the fifteenth of March, June, September, and December 1923 to June 1934, inclusive, the index numbers (1910-14=100) of prices paid by farmers for commodities bought and products sold, farm wages paid, commodities bought and farm wages, and prices paid by farmers for commodities for family maintenance and for use in production. Other tables show, by items, the amounts purchased, prices paid, and value in 1928 of annual purchases per family of food, clothing, family operating expenses, furniture and furnishings, automobiles, building materials, feed, machinery, trucks, tractors, equipment and supplies, fertilizers, and seed, and the budgets for family maintenance, supplies and equipment, and farm operating expenses.

The method of constructing and keeping the index numbers up to date is described.

Index numbers of production, prices, and income, J. I. FALCONER (*Ohio Sta. Bimo. Bul.* 172 (1935), p. 27).—The table previously noted (*E. S. R.*, 72, p. 547) is brought down through October 1934.

Live stock production and trade in live stock products as affected by the world economic crisis, S. TAUSSIG (*[Internatl. Rev. Agr.]*, *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 7, pp. 257-268).—The effects of the crisis on the production and trade in livestock and livestock products in different countries are discussed.

World supplies and requirements of wheat (*[Internatl. Rev. Agr.]*, *Mo. Crop Rpt. and Agr. Statis.* [Roma], 25 (1934), No. 10, pp. 741-760).—Tables are included and discussed showing the estimated wheat production for the 1934-35 season by continents, the exportable supplies by countries, the requirements of the importing countries, and the position of supplies and requirements.

Russia's grain exports and their future, B. BRUTZKUS, trans. by W. J. ROTH (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 662-679).—The grain export trade of Russia before the war, during the war and the revolution (1914-22), under the new economic policy (NEP, 1922-28), and during the period of socialization of agriculture (1928-), and the future prospects are discussed.

The national food supply, 1934-35 (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1934, pp. [1]+11).—The supplies of food grains, meats, dairy products, poultry products, fruits, and vegetables are discussed with tables showing for 1934-35, 1933-34, and the period 1928-29 to 1932-33 the amounts of different products in storage, September 1; the production plus carry-over of fruits and vegetables (fresh, canned, and dried), rice, wheat, and some other field crops; the August to July meat production and the July to June milk and egg production; and by geographic divisions for 1934 the production in percentages of the 1933 and the 1928-32 average of different fruits and field and commercial truck crops (for market and for canning or manufacture).

Sources of food and some factors affecting consumption in the borough of State College, Pennsylvania, D. H. WALTER (*Pennsylvania Sta. Tech. Paper* 601 (1933), pp. [6]+34; *abs. in Pennsylvania Sta. Bul.* 308 (1934), pp. 33, 34).—This mimeographed paper presents the findings of a food consumption survey covering the year ended May 31, 1933. The sources and per capita consumption of fresh fruits and vegetables, meats, eggs, dairy products, and canned fruits and vegetables, and the factors affecting consumption are shown and discussed. Some suggestions are made to local producers.

Land utilization, O. J. HALL (*Arkansas Sta. Bul.* 312 (1934), pp. 56-58).—Tables and text based on a study in Hempstead County shows the man labor and horse hour requirements to produce a bale of cotton, 100 bu. of corn, and an acre of watermelons, grass hay, and legumes.

Types of farming in Idaho.—II, The type of farming areas, N. W. JOHNSON and H. A. VOGEL (*Idaho Sta. Bul.* 208 (1934), pp. 75, figs. 66).—This is the second of the series previously noted (*E. S. R.*, 72, p. 401). It "sets up a basis for classification of farms by types and determines the relative importance of various types throughout the State. It shows the geographic distribution of the different types of farming and discusses the main characteristics of each type as they are related to the more important local influences which have shaped and are shaping the agriculture of the area."

An economic survey of sheep ranching in western Canada, L. E. KINDT (*Ottawa: Canada Dept. Agr., Agr. Econ. Branch and Expt. Farms Branch*, 1934, pp. [27], fig. 1).—This mimeographed preliminary report consists chiefly of tables showing for the period 1929-31 the capital invested, man units per sheep

unit, death losses, receipts, percentage of lamb crop, weight of lambs and fleece, and expenses per ranch on 20 ranches in the interior of British Columbia, 18 in southwestern Saskatchewan, and 62 in 3 areas of southern Alberta. Similar data by areas are also shown for 100 ranches in 5 areas in the same Provinces.

Comprehensive reclamation and land improvement in Italy, G. COSTANZO ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 5, pp. 161-174).—The Italian legislation on reclamation is briefly reviewed, and the new legislation on comprehensive reclamation and land improvement, the fundamental guiding principles of agricultural improvement under the law, the National Association of Consortia of Reclamation and of Irrigation and the financing of the works of reclamation, and the progress of the work under the law are described.

Policies governing the ownership of return waters from irrigation, W. A. HUTCHINS (*U. S. Dept. Agr., Tech. Bul.* 439 (1934), pp. 48, figs. 3).—A study was made in the 11 Western States and Nebraska and Texas to secure information upon the "extent of use of return flow for irrigation purposes, the nature of conflicts over the right of its use, its effect upon irrigation development generally, the character and operation of policies governing its control and reuse, and the necessity, if any, for further formulation or modification of policy.

Included are "(1) a description of conditions on a number of typical streams with reference to return flow, (2) a discussion of controversial questions which have arisen in connection with the appropriation of return waters and opinions of the courts bearing on these questions, (3) an impartial statement of both sides of the controversy over public v. private ownership of return water, and (4) an analysis of the principles upon which an equitable policy can be formulated. The chief purpose of the publication is to set forth clearly a statement of the equitable principles governing the use of return waters as an aid in the efficient utilization of the streams in the arid and semiarid regions."

The combine harvester, E. G. GREST (*Sci. Agr.*, 15 (1934), No. 4, pp. 244-246).—Data gathered in 1931 regarding 48 15- to 16-ft. and 15 10- to 12-ft. combines in Saskatchewan and Alberta are analyzed, and tables are presented showing the average costs, by items, per combine and per acre harvested and the relation of acres harvested to cost for each group.

A statistical analysis of farm accounts, W. H. JONES (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 613-623, figs. 5).—Using data obtained during the period 1929-31 from small pastoral farms in Wales, analysis is made of the relationships between land, labor, and raw materials where opportunities for labor-saving are few or of little importance.

The land appraisal problem, W. G. MURRAY (*Jour. Farm Econ.*, 16 (1934), No. 4, pp. 602-612, figs. 4).—In this contribution from the Iowa Experiment Station, the author discusses the determination of a farm-mortgage loan policy and the grading of land security.

Farm mortgage loan experience in southeast Alabama, E. H. MERENESS (*Alabama Sta. Bul.* 242 (1935), pp. 18, figs. 6).—A study was made of 4,750 farm mortgages made from 1917 to 1931, inclusive, by the 9 leading loan agencies operating in Coffee, Dale, Geneva, Henry, and Houston Counties, Alabama. Analysis was made of the relations of soil types, topography, sale value, appraised value, appraisers' estimates of average cotton yield, size of loan, size of farm, and borrower's equity to foreclosures. Some of the findings were as follows:

The poorer soil types were overvalued in relation to the better types. The percentage of foreclosures was lowest on sandy loam soil. Soil differences were recognized, but the differences in value were usually underestimated. The

percentage of foreclosures increased from 4 for level to 10 for rolling lands. The differential in sales values of good and poor land has been increasing since 1890. The average appraised value per acre during the period 1917-31 exceeded the highest yearly average sale value for all of the 6 soil types studied. Appraisers' estimates of the average yield of cotton corresponded closely to the actual yield the preceding year and had a direct relation to the estimates for corn and peanuts. Large farms were much poorer risks than small farms, particularly on poor soils. The percentages of loans foreclosed increased from 2 for all soil classes where the borrowers had 80 to 99 percent equity to 19 with 50 to 59 percent equity and to 30 with 0 to 29 percent equity.

System of agricultural credit in Italy, G. COSTANZO ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [Roma], 25 (1934), No. 10, pp. 425-441).—The development, underlying principles, and operation of agricultural credit in Italy, the institutions empowered to grant such credit, the enactments to meet urgent contingencies during the past few years, and the other important enactments since the reform of 1927 are described.

Financial situation of Arkansas public schools, C. O. BRANNEN and H. W. BLALOCK (*Arkansas Sta. Bul.* 314 (1935), pp. 22, figs. 3).—The historical development of the public school system is described, and analysis is made of the amount and causes for the increase in expenditures and the current financial situation. The trend in school revenues is discussed with tables showing, by counties, the amount of delinquency in taxes, 1933, the reduction in assessed taxes, 1929 to 1933, and the sources of revenue, 1922-23 to 1933-34.

The expenditures increased 1,049 percent from 1900 to 1930. Decreased purchasing power of the dollar used about one-third of the increase; increased enrollments, longer terms, additional grades, and improved facilities about one-third; and higher qualifications for teachers, enlargement of the course of study, better supervision, etc., about one-third. From 1906 to 1924 State support of schools was limited. From 1924 to 1927 it averaged about 40 percent of the expenditures, and by 1933 it had declined to 26.1 percent. Revenues from local property taxes also declined about 40 percent from that of 1930, due largely to delinquency and the reduction in assessed valuation. In 6 percent of the districts 40 percent or more of the operating revenues was required for debt services, but in about 75 percent of the districts there was no debt, showing the chief problem of most districts to be shortage of funds rather than indebtedness.

Relative costs of providing elementary education for country children in one-room schools and in town elementary schools, H. M. HAMLIN (*Iowa Sta. Rpt.* 1934, pp. 25-27).—Based on a study in Adams, Story, and Washington Counties, data are presented as to the general condition of the schools, operating costs, possible reduction in transportation costs, etc.

Certain financial aspects of local governments in Maryland, W. P. WALKER (*Md. State Planning Comm.*, 1934, pp. 97, figs. 15).—This is a report prepared for the State Planning Commission of Maryland. It discusses, with charts and tables showing data by counties, the taxable bases and levies for local purposes, the uncollected taxes and tax collection procedure, and the debt situation. Recommendations are made as to objectives for providing more efficient, effective, and economical governmental units, better tax collection procedure, and greater safeguards for the public credit.

Agricultural cooperation in Hungary (*La cooperation agricole en Hongrie*. Budapest: Union Socs. Coop. Hongroises, 1934, pp. 75, pl. 1, figs. 41).—This is a description of the various cooperative societies and organizations, prepared by the Union of Cooperative Societies on the occasion of the Sixteenth International Congress of Agriculture, held at Budapest.

RURAL SOCIOLOGY

Rural social organization in south-central Arkansas, T. C. McCORMICK (*Arkansas Sta. Bul. 313 (1934), pp. 39*).—This is the third of a series of reports (E. S. R., 71, p. 125) indicating the relative extent to which the farm people of Arkansas are centering their activities and organizations in the open country, villages, and cities. A strip was taken from 10 to 20 miles wide, beginning about 8 miles southwest of Fordyce and extending northeast to the city of Pine Bluff, and representing a relatively infertile and piney woods area. The topography varies from undulating to flat, with low swampy bottoms. The main industry is farming, with a small amount of lumbering. About one-third of the land is in farms and one-sixth is crop land. Cotton and corn are the principal crops. About 2 out of every 5 farmers are tenants. The average value of land and buildings per farm is approximately \$1,600 and of farm implements and machinery \$115.

The density of population is about 20 per square mile. Pine Bluff excepted, about 75 percent of the population is rural-farm. About 65 percent are whites and 35 percent negroes, practically all native born. Illiteracy of persons 10 yr. of age and over is about 2 percent for whites and 16 percent for negroes. Compared with the rural-farm population in 1930, the sample population showed an excess of aged persons and males, and somewhat larger households.

For all types of participation and services, the 348 families studied went about equally to the open country and cities, and to a less extent to villages. Among both cities and villages the trend was toward the larger centers. Most confined to open country neighborhoods were religious and social activities and elementary education, in the order named. Cities led in newspaper, health, economic, and recreational services. No activities were chiefly village-centered, but the farm people depended on villages for secondary education and economic services more than for other things. Excepting buying and selling, the sample population participated in religious activities more and in educational activities less than in any other kind. The great bulk of the social contacts and interests of the families were enclosed in a circle averaging about 4 miles in radius, and an average distance of 8 miles included all types of participation. The investigated factors associated with the kind, amount, and place of participation were age, sex, tenure or economic status, and automobile ownership. Age probably led, with tenure or economic status second, and automobile ownership third. Automobile ownership was associated with a marked preference for cities over villages as trade centers.

In no field of activity could organizational structure in this area at the time the survey was made be considered satisfactory, yet a hopeful beginning has been made toward improving organizations in all fields except perhaps that of religion. Cooperative buying and selling associations, consolidated schools, progressive efforts at social and recreational organization, agricultural extension activities, county nurses and physicians, and charity organizations were already present, and it seems likely that most of them will expand their range and effectiveness as agencies for improving the quality of life for people permanently attached to the farms of this area.

The social characteristics, organization, and activities of the people on Muscatine Island as they bear upon problems of land utilization, R. E. WAKELEY (*Iowa Sta. Rpt. 1934, p. 25*).—This is a study by the participant observer method of 169 families on Muscatine Island between November 1, 1933, and April 1, 1934, in which the economic and social activities of the people were analyzed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the Fourth International Congress of Agricultural Education (*Acts du IV. Congres International de l'Enseignement Agricole, Rome-Milan, 24-31 Octobre, 1932. Roma: Off. Internatl. Enseig. Agr., 1934, vols. 1, pp. 431; 2, pp. 430; 3, pp. 506*).—Volume 1 includes information as to the organization of the Congress, lists of the officers, committees, countries participating, the program, and the proceedings of the various sections of the Congress held at Roma and Milano, October 24-31, 1932. Volume 2 includes the papers presented by the representatives of different countries in the sections on higher education, secondary education, and extension education. Volume 3 includes the papers on general education, psychology, rural sociology, rural life betterment, and agricultural economics, and miscellaneous reports and communications.

Motion pictures of the United States Department of Agriculture, 1934 (*U. S. Dept. Agr., Misc. Pub. 208 (1934), pp. III+36*).—This is a classified list as of December 1934 of the motion-picture films available. The method of distribution, costs to borrowers, etc., are given.

FOODS—HUMAN NUTRITION

Nutrition, M. S. CHANEY and M. AHLBORN (*Boston: Houghton Mifflin Co., 1934, pp. XXV+436, figs. 55*).—This volume has been prepared as a text for college, university, or normal school students in home economics, but is well adapted to serve as a reference book for the homemaker with a minimal background of organic chemistry and physiology who wishes to plan optimal diets.

The first four chapters deal with the essentials of nutrition, including the relation of nutrition to health, the function of and requirements for energy, protein, calcium, phosphorus, iodine, the vitamins, and the body regulators (water, acids, and bases), and the hygiene of the digestive tract (digestion, absorption, and elimination). The remaining four chapters are devoted to the requirements for optimal nutrition during the reproductive period, the first year, and childhood, and the selection of an adequate diet.

The book is abundantly illustrated, and at the end of each chapter are a few problems, laboratory exercises, and a selected list of literature references. An appendix contains useful tables from various sources and brief description of methods of animal experimentation applicable to vitamin testing and anemia tests, methods of preparing the constituents of experimental diets, and directions for the use of the Benedict-Roth recording metabolism apparatus.

Nutrition in health and disease, C. J. BARBORKA (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 1, pp. 44-49*).—A brief discussion of the essential requirements for all diets is followed by a classification of diseases in which diet is of paramount importance and those in which it is of varying importance, with suggestions as to the basic principles involved in the dietary treatment of a few of the diseases listed.

Newer trends in nutrition, S. L. SMITH (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 2, pp. 107-122*).—This review deals particularly with interrelationships in nutrition, with a few examples of recent progress in the field of vitamins and essential minerals. Among the relationships discussed are those of vitamin A deficiency and infection, vitamin B and appetite; vitamin G and pellagra; vitamin C and tissue metabolism; vitamin D, calcium, phosphorus, and the parathyroid hormone; and the complex interrelationships of various factors in the different anemias.

A list of 58 references to recent literature is appended.

[**Studies in foods and nutrition at the Iowa Station**] (*Iowa Sta. Rpt.* 1934, pp. 51, 81, 144-149, 165, 166).—Progress reports (E. S. R., 71, p. 556) are given by J. A. Schulz on the effects of the ingestion of fluorides on the teeth, bones, blood, and tissues of albino rats (p. 51); by V. E. and P. M. Nelson and B. Lowe on the effect of hydrogenated lard, storage lard, and heated lard on the destruction of vitamin A in foods (p. 81); by P. M. Nelson, Lowe, W. F. Coover, and J. H. Buchanan on the relationships of the physical and chemical characteristics and constants of lard to its culinary value (pp. 147-149); by P. M. Nelson and P. P. Swanson on differences in nutritive value of diets in which beef muscle and pork muscle in canned dried form serve as the chief source of protein (pp. 144, 145); by P. M. Nelson and Swanson on the influence of experimental technic during the preliminary depletion period in vitamin A determinations on the response of the test animals to supplementary feeding of the vitamin and on conditions influencing the production of uniform experimental animals in the stock colony (pp. 145, 146); by P. M. Nelson, Swanson, and E. S. Haber on the vitamin A, B, C, and G content of canned tomatoes and the A content of Prolific sweetpotatoes grown with varying fertilizer treatments (pp. 146, 147); and by G. W. Snedecor on disproportionate frequencies in analysis of variance of tables of double classification, as applied to numbers and mean gains in weights in 4 generations of rats (pp. 165, 166).

Studies on tenderness and juiciness of cooked meat, I. T. NOBLE, E. G. HALLIDAY, and H. K. KLAAS (*Jour. Home Econ.*, 26 (1934), No. 4, pp. 238-242).—"This paper reports a study of the tenderness of cooked beef as determined by a New York testing laboratory penetrometer, modified in general according to Tressler, Birdseye, and Murray's suggestions [E. S. R., 68, p. 272], of the quantity of juice expressed with a hydraulic press, and of certain chemical characteristics of this juice. After the methods were checked by several series of experiments on the right and left sides of the same animal, they were used to measure the difference which is generally recognized as a result of subjective tests between the rib and a section of the round from the same animal and between the right and left ribs cooked to different interior temperatures."

The differences between averages for corresponding left and right wholesale rib cuts treated in the same manner were less than 2 mm. For cuts heated to internal temperatures of 61° and 75° C., respectively, the differences were from 55.5 to 75 mm, and for ribs against a section of round from the same animal from about 71 to 127 mm.

When subjected to a pressure of 3,000 lb. per square inch, the ribs cooked to an internal temperature of 61° yielded more juice than those cooked to 75°, and the rounds more than the corresponding rib cuts. The larger quantities of juice also proved richer in solids and total nitrogen, and in one case also richer in coagulable nitrogen.

Factors influencing the apparent shortening value of a fat, I. T. NOBLE, H. McLAUGHLIN, and E. G. HALLIDAY (*Cereal Chem.*, 11 (1934), No. 3, pp. 343-346).—"Certain manipulative factors which had been suspected of influencing the breaking strength of sugar wafers were tested with a Bailey shortometer [E. S. R., 71, p. 557]. Creaming of the fat and sugar to the maximum volume of which this fat (a hydrogenated lard) was capable produced wafers slightly but significantly more crisp than creaming to a minimum volume, the difference in breaking strengths being 2.6 ± 0.13 oz. Thorough, in contrast with incomplete, mixing of the dough had approximately the same effect, the difference here being 3.6 ± 0.12 . Rolling without flour produced markedly more tender wafers, ones in fact with breaking strengths

only a little more than half as great as rolling with the minimum necessary to prevent sticking, 15.7 as against 28.1 oz. Beating extra flour into the dough gave a more tender product than using it in rolling, but a less tender one than omitting it altogether."

The rancidity problem and new developments with particular reference to the effect of light, M. R. COE (*Cereal Chem.*, 11 (1934), No. 3, pp. 241-258, figs. 4).—In this contribution from the Bureau of Chemistry and Soils, U. S. D. A., the author reviews the literature dealing with the prevention of the deterioration of oils and fats due to rancidity of the oxidative type, particularly his own investigations with LeClerc (E. S. R., 68, p. 698) on the influence of light of various wave lengths. These investigations led to the discovery that when "oil-bearing foods subject to rancidity are enclosed by green of a proper shade, the deleterious wave lengths of light which cause rancidity are absorbed by the wrapper or container instead of by the light sensitive substance which causes the characteristic spoilage."

The commercial importance and application of these findings are discussed briefly, and suggestions are given for further lines of work. An extensive list of literature references is appended.

Report of the 1933-34 committee on the standardization of laboratory baking, W. F. GEDDES ET AL. (*Cereal Chem.*, 11 (1934), Nos. 4, pp. 360-395, figs. 9; 5, pp. 451-504, figs. 17).—This annual report (E. S. R., 71, p. 415) contains a brief summary of the activities of this committee of the American Association of Cereal Chemists (pp. 360-362), an outline of the proposed Official A. A. C. C. basic baking test (pp. 363-367), and the following subcommittee reports: Yeast Variability and Its Control in Flour Gassing Power Tests, by R. M. Sandstedt and M. J. Blish (pp. 368-383); Comparison of a Bromate and Malt-Phosphate-Bromate Formula in Testing Wheat Quality for the Plant Breeder, by W. F. Geddes and A. G. McCalla (pp. 384-395); Studies on Experimental Baking Tests—I, Effects of Variation in Baking Formulas on Gas Production and Loaf Volume (pp. 451-470), and II, The Application of a High Yeast-Sugar Formula in Evaluating Flour Strength (pp. 470-486), both by R. K. Larmour and S. F. Brockington; and The Behaviour of Strong Flours of Widely Varying Protein Content When Subjected to Normal and Severe Baking Procedures, by T. R. Aitken and W. F. Geddes (pp. 487-504).

Modified proofing cabinet, H. W. PUTNAM (*Cereal Chem.*, 11 (1934), No. 5, pp. 569, 570, fig. 1).—A modified proofing cabinet is described which is said to give practically perfect temperature control within a range of not over $\pm 0.5^{\circ}$ C., together with desirable humidity conditions in either summer or winter on the full surface of the upper shelf. The proper circulation of air is achieved by the use of two cheap blowers similar to those used in certain automobile heaters. Adequate humidity is provided by dampened wicks of outing flannel hung on frames to fill the space between the upper and lower shelves.

Fermentation response and fermentation tolerance, Q. LANDIS and J. FREILICH (*Cereal Chem.*, 11 (1934), No. 4, pp. 396-402, figs. 4).—To determine the effect of fermentation upon flour colloids by baking methods, a modification of the technic described by Bailey and Johnson (E. S. R., 53, p. 410) was used. The essential changes in the technic are summarized as follows: "(1) The use of 90 percent sponges; (2) supplementing the diastatic level with nondiastatic malt; (3) baking at a volume approaching that of the maximum dough volume.

"The maximum dough volume has been found to change in a regular manner with the amount of fermentation. The loaf volume obtained under the same conditions reflects this change in a degree roughly comparable to the

fraction of the maximum dough volume (termed characteristic loaf volume) at which the loaves were baked. Loaves baked at normal characteristic volumes (40 percent to 45 percent) frequently show but slight fermentation response."

Report of the committee on testing rye flour, L. H. BAILEY (*Cereal Chem.*, 11 (1934), No. 4, pp. 409-413).—This report of a committee of the American Association of Cereal Chemists outlines tentative methods which have been adopted for making test loaves of the three principal types of rye bread—white, medium, and dark—for use in the development of score cards, and presents scores of collaborative baking tests of rye breads thus prepared.

Experimental equipment for the manufacture of alimentary pastes, C. C. FIFIELD (*Cereal Chem.*, 11 (1934), No. 3, pp. 330-334, figs. 3).—A description, with illustrations, is given of the equipment installed in the Bureau of Plant Industry, U. S. D. A., for the experimental manufacture of macaroni in the testing of different varieties of wheat.

Cake, cracker, and pretzel manufacture, H. O. TRIEBOLD (*Pennsylvania Sta. Bul.* 308 (1934), p. 8).—This progress report summarizes the results obtained in a study of the effect of various factors on the rate of oxidative deterioration of prime steam lard and on the prevention of its deterioration.

The physical characteristics and chemical composition of various brands of toyo (soy sauce) sold in the Philippines, F. T. ADRIANO, S. B. OLIVEBOS, D. S. SANTOS, and E. R. VILLANUEVA (*Philippine Jour. Agr.*, 5 (1934), No. 3, pp. 171-186).—Physical and chemical constants and proximate analyses are reported for 21 samples of toyo (soybean sauce), including 1 from Japan, 2 from China, and 18 from Philippine factories.

In comparison with the standards formulated by A. G. Hermano of the Philippine Bureau of Science, 19 of the samples fell within the range of 1.2-1.25 for specific gravity, all contained more than the minimum quantity of total solids (not less than 26 g per 100-cc sample), but only 6 met the protein standard of not less than 4.5 percent, the protein values ranging from 1.58 to 13.37 percent.

The report contains, in addition to the analytical data, figures on the annual importation of soybean sauce into the Philippines by countries of origin from 1928 to 1933, inclusive, a discussion of the principles involved in toyo manufacture, and a description of the manufacturing process.

The iron, copper, and manganese content of California prunes, L. G. SAYWELL, W. H. DIETZ, and P. D. ROBERTSON (*Jour. Assoc. Off. Agr. Chem.*, 17 (1934), No. 2, pp. 290-293).—Five samples of prunes from each of the three principal prune-growing districts of California were analyzed for iron by the thiocyanate method of Stugart (*E. S. R.*, 69, p. 493), copper by the copper-pyridine-thiocyanate method of Gebhardt and Sommer (*E. S. R.*, 67, p. 653), and manganese by the persulfate method of Newcomb and Sankaran as modified by Davidson and Capen (*E. S. R.*, 66, p. 806).

Average values for iron for the three lots were 0.00463, 0.00337, and 0.00437 percent of edible material on a 20 percent moisture basis. Corresponding values for copper were 0.00024, 0.00031, and 0.00034 percent, and for manganese 0.00046, 0.00039, and 0.00047 percent. The variations of the individual samples from a single district were found to be of about the same magnitude as the averages from the three districts.

Public health aspects of dried foods, P. F. NICHOLS (*Amer. Jour. Pub. Health*, 24 (1934), No. 11, pp. 1129-1134).—Reviewing briefly the literature on commercial drying methods for fruits and vegetables and on reported outbreaks of food infection or poisoning traced to dried foods, the author concludes that

this class of foods does not appear to be a serious health hazard and that the increasing use of machine-filled small containers and of pasteurization offers increased protection. The question of the use of sulfur dioxide or sulfites in the drying of certain fruits is discussed at some length, and a liberalization of existing regulations in certain States is urged in view of the excellent nutritive value and low relative cost of sulfur-dried fruits, "the seemingly well-established harmlessness of the preservative, and the protection it affords against infective agents and vitamin losses."

Health problems connected with the ethylene treatment of fruits, E. M. CHACE (*Amer. Jour. Pub. Health*, 24 (1934), No. 11, pp. 1152-1156).—The author discusses briefly the steps leading up to the discovery that ethylene hastens the ripening process and development of color in fruits, the methods followed and changes produced in different fruits, health hazards, and the possible effect of the treatment on the vitamin C potency of juices made from ethylene-treated fruits. "In conclusion we feel that the ethylene process has deservedly found a place in the preparation of fruit for the market, that it is harmless, and that with proper State and Federal regulation little if any fraud can be perpetrated through it."

Bacteriological problems in home-canning procedures, F. W. TANNER (*Jour. Home Econ.*, 26 (1934), No. 6, pp. 365-376).—The author presents convincing arguments for the steam-pressure cooker method of canning nonacid foods as the only safe method, and condemns the boiling water and oven processes as wasteful because of the frequent spoilage of the canned foods and dangerous because of the possibility of botulism. The publications of the U. S. Department of Agriculture and of the various State extension services on home canning are reviewed, and the methods of processing recommended and not recommended by the latter services are tabulated.

Swelling in canned chopped hams, L. B. JENSEN, I. H. WOOD, and C. E. JANSEN (*Indus. and Engin. Chem.*, 26 (1934), No. 10, pp. 1118-1120).—Examination of 1,000 cans of spiced ham and luncheon meat of various brands coming out of incubation as swells has shown the presence of gas-forming organisms of the genus *Bacillus*. These organisms have been found in large numbers on the spices and wrapping paper used in the canning of the meat rather than on the meat itself. It is pointed out that the problem of eliminating these bacteria from paper and spices lies in the province of the manufacturers concerned.

A study of the mechanism of CO₂ formation in spiced meats showed that nitrates, sugars, and the cured meat must be present together. If the nitrate is absent, anaerobic fermentation may take place instead of aerobic.

It is suggested that in place of incubation tests for these meat products the meat from aseptically opened cans should be examined for gas-forming organisms by direct bacteriological tests.

Your meals and your money, G. HAMBIDGE (*New York and London: McGraw-Hill Book Co.*, 1934, pp. XVI+190, figs. 16).—This book is largely a popular presentation of the material in U. S. Department of Agriculture Circular 296, Diets at Four Levels of Nutritive Content and Cost (E. S. R., 70, p. 416). The author uses his own family as an illustration of the practical application of the data in solving the problem of family food selection under varying financial conditions as regards costs, food groups, quantities, and nutrition value. A chapter on thrift translates into more popular terms the material in the circular dealing with factors affecting food prices and food costs.

The final chapter entitled National Well-Being interprets, with a "tree of agriculture" as an illustration, statistics prepared by the Agricultural Adjust-

ment Administration on the changes in agriculture which will be required to promote the higher standard of living called for by the optimal diet. The closing section in this chapter emphasizes the need for continuing research in nutrition under full steam. "Only because of scientific research can we now begin to formulate what is an optimum diet. New discoveries have been piling up perhaps faster than they could be digested or put into practice—but innumerable questions remain to be answered. And there is not only new work—more accurately defining our needs for various food elements, more accurately determining their functions and uses in the body, and perhaps discovering new elements—but also the patient, detailed cleaning up of old work. Every food we use, for example, should be investigated as carefully as milk has been investigated. This sort of information makes it possible to plan diets intelligently, weighing both nutritive and economic values."

Certain quantitative data too technical to be included in the text are given in the form of supplements.

Feeding the average family in present-day economic conditions, S. MATHEWS (*Jour. Amer. Dietet. Assoc.*, 10 (1934), No. 1, pp. 20-23).—In discussing present-day dietary problems, conditions in Georgia are cited as an example. A comparison of the average Georgia rural diet, as shown in an earlier study (E. S. R., 63, p. 486), with the restricted diet for emergency use recommended by Stiebeling and Ward (E. S. R., 70, p. 416), showed that the former contained less milk (9 percent as compared with 12) and fruits and vegetables (9 percent as compared with 14), but more lean meats and eggs (11 percent as compared with 5). An adequate food production program is emphasized as of supreme importance in feeding the average rural family, and it is suggested that practically the entire amount of land retired from cotton production might well be used in a food production program for the State.

An economic study of the food consumption of farm families in the South Carolina Piedmont, A. M. MOSER (*South Carolina Sta. Rpt.* 1934, pp. 68-72).—This preliminary report includes tabulated data for the year 1932 on the average weekly per capita consumption of specified foods or groups of foods by white and negro farm families in the South Carolina Piedmont whose diets were adequate in all respects, barely adequate, and inadequate, respectively; the number and percentage of the dietaries below standard in respect to each of the specified nutrients with the intake per consumption unit; and the retail money values of the dietaries, with the proportion of the values derived from home-produced foods.

Studies in racial metabolism.—Basal metabolism of the Araucanian Mapuches, J. PI-SUÑER (*Amer. Jour. Physiol.*, 105 (1933), No. 2, pp. 383-388).—Previously noted from another source (E. S. R., 72, p. 720).

Taste and chemical constitution, A. J. MEE (*Sci. Prog. [London]*, 29 (1934), No. 114, pp. 228-235).—This review of the rather meager literature on the subject points out the difficulties in the way of any satisfactory theory for the relationship between taste and chemical constitution. "When we have a rational standard upon which to base a scale of taste, and the personal element can be eliminated, we still have to discover the relationship between the arrangement of the groups in the molecule of the compound and its taste, before any comprehensive theory can be drawn up."

A list of 14 references to the literature is appended.

Taste and chemical constitution (*Lancet [London]*, 1934, II, No. 22, pp. 1233, 1234).—An editorial comment on the above-noted paper.

Studies on the nutritive deficiencies of cow's milk and milk preparations [trans. title], E. GLANZMANN (*Ztschr. Vitaminforsch.*, 3 (1934), No. 1, pp. 2-27, pls. 3, figs. 8; *Eng., Fr. abs.*, pp. 26, 27).—Young rats were fed for a

year on fluid whole milk or dried whole milk. After a period of normal growth there was definite retardation of growth, with slight atrophy of the testicles, pronounced atrophy of the mammary glands, complete sterility or inability to suckle the young, and premature senility, and on the liquid milk cardiac hypertrophy. No signs of rickets or anemia were noticed. One of the principal deficiencies in the milk was thought to be manganese, for rats receiving 0.05 percent of manganese as a supplement to the milk were able to suckle their young.

Rats fed nothing but sweetened condensed milk developed pellagra-like symptoms which were cured by supplementing the milk with coagulated egg albumin. Evaporated milk did not give rise to pellagra, but the animals receiving it began to lose weight after from 60 to 80 days and died in about 110 days. On skim milk powder some of the animals died as early as 11 days. When the milk was supplemented with glucose and sucrose the survival period was prolonged, but maltose, maltodextrin, and lactose were without effect. Dried buttermilk had a very toxic effect of the nature of a protein intoxication, ultimately fatal, accompanied by paralysis of the spinal cord. The symptoms could be prevented by supplementing the buttermilk with lactose, lard, or cod-liver oil.

Special milk in the solution of the iodine deficiency problem, W. WESTON (*Arch. Ped.*, 51 (1934), No. 11, pp. 683-690).—The various functions of iodine in metabolism and the complexity of the problem of iodine deficiency are discussed preliminary to the report of the general findings in an extensive series of analyses made at the South Carolina Food Research Laboratory (E. S. R., 62, p. 893) of milk obtained from 8 collecting points in South Carolina and dried at the laboratory and of dried milk from commercial plants in New York and Wisconsin.

The highest iodine values were obtained in samples from 2 collecting points in South Carolina. These contained 1,170 and 1,872 parts of iodine per billion, respectively, as compared with 392 parts per billion in samples from the New York area and 395 parts per billion from the Wisconsin area.

The results are also summarized of comparative feeding experiments conducted on children of various ages with ordinary milk and milk of an especially high iodine content. The children receiving the milk of high iodine content showed superiority over the controls in growth, development, and general health. No cases of thyroid enlargement or other symptoms of iodine deficiency were found.

Human milk studies.—XV, The non-protein nitrogen constituents, B. N. ERICKSON, M. GULICK, H. A. HUNSCHER, and I. G. MACY (*Jour. Biol. Chem.*, 106 (1934), No. 1, pp. 145-159, fig. 1).—In continuation of the investigation noted previously (E. S. R., 71, p. 130), "the magnitude of variation of certain nonprotein nitrogen constituents in milk has been observed in the first and last halves of the nursing period, at different times of the day and night, during several successive days, and at intervals throughout lactation. In addition, the nonprotein nitrogen partition, urea, amino acids, uric acid, creatine, and creatinine of milk during the initial days of lactation and in an instance of high fever of a subject in early lactation has been studied in considerable detail."

In the initial days of lactation the nonprotein nitrogen partition of the milk was abnormal and irregular, with high nonprotein nitrogen, uric acid, creatine, and creatinine. Similar abnormalities were found in the milk secreted during a fever. The total nonprotein nitrogen and amino acid nitrogen were of practically the same concentration in the milk from the first and last halves of the nursing period and in the milk from the right and left breasts. Both va-

ried appreciably throughout the day and night, with maximal values in the afternoon or evening and minimal values in the morning. "The concentration of the nonprotein nitrogen constituents in the milk varied from day to day, more so throughout lactation, and most widely among different women.

"The data indicate that under normal physiological conditions the concentration of nonprotein nitrogen constituents in the milk is similar to that observed in the blood. Under abnormal conditions of bodily disturbances, drastic alterations may occur in the nonprotein nitrogen partition of the milk, alterations which may serve clinically as an index of such bodily disturbances as reflected in the blood."

Studies on the fat of human milk, A. W. BOSWORTH (*Jour. Biol. Chem.*, 106 (1934), No. 1, pp. 235-244, fig. 1).—Pure breast milk fat prepared from mixed milk of women receiving a varied diet in a maternity hospital was analyzed for the usual constants, and a 1,000-g portion of the fat was converted into methyl esters and fractionated into about 30 fractions.

The milk fat had the following constituents: Melting point 32° C., saponification number 205.1, Reichert-Meissl number 2.5, Polenské number 0.1, iodine number 56.22, and unsaponifiable matter (percent) 1.13.

Fatty acids of low molecular weights were found to be present in the fat in much smaller quantities than in the fat from cow's milk. A maximum was obtained at the lauric acid point, and from the highest fraction there was isolated a mixture of saturated acids of greater molecular weight than that of stearic acid. The presence was established of tetradecenoic ($C_{14}H_{26}O_2$), hexadecenoic ($C_{16}H_{30}O_2$), oleic ($C_{18}H_{34}O_2$), and linoelic ($C_{18}H_{32}O_2$) acids. There was evidence of the occurrence of unsaturated acids with greater molecular weights than those of the C_{18} series, and at least two highly unsaturated acids of the arachidonic type were shown to be present.

A study of 45 consecutive premature infants fed on frozen mother's milk, A. STERN and D. P. LIEBERMAN (*Arch. Ped.*, 51 (1934), No. 12, pp. 799-801).—A brief report is given of the use of breast milk preserved by freezing in the feeding of premature infants. Of 45 consecutive cases, 13 died within the first 24 hr. and only 3 during the remaining period of hospital care. The average initial loss in weight was 6.5 oz. The infants began to gain on the sixth day and regained their birth weight in from 12 to 14 days. In 75 percent of the cases the milk was administered by stomach tube diluted with water at first and after the sixth day supplemented with evaporated milk. At the end of the second week cod-liver oil in small doses was started and orange juice as well. At times a dried milk was used in complementary feedings.

Experimenting with foods and sleep.—I, Effects of varying types of food in offsetting sleep disturbances caused by hunger pangs and gastric distress—children and adults, D. A. LAIRD and H. DREXEL (*Jour. Amer. Dietet. Assoc.*, 10 (1934), No. 2, pp. 89-99, figs. 6).—The experiments reported, which were conducted on 8 healthy young men and 8 healthy children from 4½ to 8 yr. of age, were planned to measure the extent to which the quality of sleep can be improved by the ingestion of food just before going to bed. Two types of lunches were used—corn flakes and milk as an "easy to digest" meal and a variety of foods, especially those rich in hemicellulose, as a "hard to digest" meal. The quality of the sleep was measured by the number and extent of movements made during the night, as recorded by a device known as the somnokinograph, which is described with diagram. The entire investigation covered a period of 5 mo., during which data were gathered every night for from 6 to 8 weeks for each subject. The children were studied in their own homes and the adults in the sleep laboratory.

The results for both groups are charted in the average number of movements in 8 hours' sleep following the easy to digest bedtime lunch, regular supper with no food before going to bed, and the hard to digest bedtime lunch. As compared with the number of movements during the night with no bedtime lunch, the numbers after the hard to digest meal were 19 percent more and after the easy to digest meal 14 percent less for the children. Corresponding figures for the adults were 6 percent more and 6 percent less, respectively.

An analysis of the variables in the hour-to-hour records of 6 of the adults showed that most of the improvement in sleep quality following the easy to digest lunch occurs in the first half of the night.

The effect of caffeine, coffee, and decaffeinated coffee upon blood pressure, pulse rate, and certain motor reactions of normal young men, K. HORST, W. D. ROBINSON, W. L. JENKINS, and DJI-LIH BAO (*Jour. Pharmacol. and Expt. Ther.*, 52 (1934), No. 3, pp. 307-321, fig. 1).—Fourteen men from 20 to 25 yr. of age served as subjects in a comparison of the effect of coffee, a decaffeinated coffee (Kaffee Hag), and decaffeinated coffee plus caffeine upon simple and acquired motion tests. The caffeine-containing beverages, which furnished from 3 to 4 mg of caffeine per kilogram body weight, were taken at intervals of from 2 to 7 days, with decaffeinated coffee or bouillon on the intervening days. The motor tests, with few exceptions, were conducted from $\frac{1}{2}$ to 1 hr. after the administration of the two beverages and thereafter at the same hour of the day 5 days a week. Blood pressures and pulse rates were determined after the subjects had been engaged for 20 or 30 min. in the performance of the two tests.

In all but one of the subjects the blood pressures after decaffeinated coffee or bouillon were relatively constant from week to week, but the pulse rates did not remain at a constant uniform level for more than 2 or 3 weeks at a time. No alteration took place in either blood pressure or pulse rate on changing from decaffeinated coffee to bouillon, but after coffee or caffeine both blood pressure and pulse rate changed to a slight degree. The blood pressure usually increased 1 or 2 hr. after the drug, and the pulse rate decreased in some subjects and increased in others. After 25 hr. the blood pressure was normal, but the pulse rate was occasionally increased.

The performance of the simple motion test was usually improved 1 or 2 hr. after coffee or caffeine, but impaired in certain subjects 25 hr. after the administration of the drug. Caffeine exerted a sustained deleterious influence upon the performance of the acquired motor skill test for several days. Decaffeinated coffee was without effect.

The relationship of the metabolic nitrogen of the faeces to body weight and to food intake for rats, B. H. SCHNEIDER (*Biochem. Jour.*, 28 (1934), No. 1, pp. 360-364, figs. 2).—With a view to reconciling the differences of opinion among various investigators concerning the estimation of metabolic nitrogen of the feces, the author has summarized, 1,160 determinations of metabolic nitrogen conducted on rats of different body weights and consuming different amounts of food. About one-third of the determinations were from the author's unpublished data and the remainder from the literature.

The correlation of metabolic nitrogen and food consumed gave a regression line of significant slope which measured the rate of increase of metabolic nitrogen as more food was consumed throughout most of the range. At the lowest and highest food intakes, however, the straight line relationship did not hold. This is thought to indicate that there is a constant fraction of metabolic nitrogen, as well as one which varies with the food intake. "If for any reason one fraction is much larger than the other, the impression may easily be created

that the metabolic nitrogen is all of that fraction, either all constant or all proportional to food intake. Mitchell [E. S. R., 51, p. 407] noted a relationship of metabolic nitrogen to body weight, but recognized with his small rats a much greater relationship to food intake. Boas Fixsen [E. S. R., 69, p. 895] with large rats found 'no evidence in support of such a relationship'.

The technics followed by these two authors are discussed in considerable detail, with the conclusion that the ratio milligrams of metabolic nitrogen per gram of food, as used by Mitchell, "lies well within the limits of experimental error when more than a certain minimum quantity of low-nitrogen food is ingested daily, and that it affords an appropriate means of computing the metabolic nitrogen in protein-feeding periods."

The effect of the proportions of fat and carbohydrate in the diet upon the excretion of metabolic nitrogen in the feces, H. H. MITCHELL (*Jour. Biol. Chem.*, 105 (1934), No. 3, pp. 537-546).—In extension of earlier studies dealing with the so-called metabolic nitrogen of the feces (E. S. R., 51, p. 407), the paired feeding method has been used to determine the comparative effects of fat and starch upon the excretion of metabolic nitrogen, with results summarized as follows:

"The substitution of fat for starch in a diet does not affect the excretion of metabolic nitrogen in the feces, even though the total amount of dry fecal material produced is considerably increased thereby. The ratio of metabolic fecal nitrogen to dry matter consumed is increased at levels of food intake that, in a low fat diet, will not maintain body weight, apparently because of the increasing prominence of a fraction of the metabolic nitrogen which is truly a metabolic excretion and which is constant for each individual organism. At higher levels of food intake this fraction is inconsiderable in comparison with the fraction representing a wastage in digestion, which probably consists of residues of digestive secretions. The distinction between these two fractions was first clearly made by Schneider."

Studies in avian carbohydrate metabolism.—Further studies upon the action of catatorulin in brain, R. A. PETERS and H. M. SINCLAIR (*Biochem. Jour.*, 27 (1933), No. 6, pp. 1910-1926, figs. 5).—Essentially noted from another source (E. S. R., 71, p. 728).

Vital need of the body for certain unsaturated fatty acids, IV-VI, H. M. EVANS, S. LEPKOVSKY, and E. A. MURPHY (*Jour. Biol. Chem.*, 106 (1934), No. 2, pp. 431-450, pl. 1).—In continuation of the series noted previously (E. S. R., 69, p. 464), three papers are presented.

IV. *Reproduction and lactation upon fat-free diets* (pp. 431-440).—On the authors' unsupplemented fat-free diet about 95 percent of female rats having litters did so from 1 to 3 days late, and 80 percent of the young were born dead. Both the numbers of the young and the birth weights were markedly subnormal, and the young did not suckle. In about 20 percent of the animals implantation occurred, but with subsequent failure to litter. This could not be attributed to lack of vitamin E and could not be corrected by further additions of vitamin A or D or by carotene. When the fat-free diet was supplemented by the unsaturated fatty acids previously found to be essential, there was a reduction in the prolonged gestation rate and a definite increase in the numbers having litters, the number of young born, and the average weights at birth. The majority of the mothers nursed their young, but the litters were undersized on weaning. On further supplementing the diet with 25 percent lard or butterfat, the weights at weaning approached normal and were not improved by transferring the animals to a diet of natural foodstuffs.

V. *Reproduction and lactation upon diets containing saturated fatty acids as their sole source of energy* (pp. 441-444).—The diet used in this study consisted of casein 40, hydrogenated coconut oil 60, and McCollum salt mixture 185.5 parts, with 1 g per rat per day of ether-extracted brewer's yeast as the source of vitamins B and G, the nonsaponifiable matter from 0.5 g wheat germ oil weekly for vitamin E, and 50 mg daily of a preparation of the essential unsaturated acids for which the authors use the term vitamin F.

On this diet gestation was unsuccessful if vitamin F was not added, but successful in the presence of the mixture of fatty acids constituting vitamin F. Lactation was not normal even when all of the known supplements were increased.

VI. *Male sterility on fat-free diets* (pp. 445-450).—Of 14 male rats reared on the fat-free diet with the small daily supplement of vitamin F, all were fertile as judged by histological examination of the testes, although 4 did not copulate. In the group of 11 males on this diet without vitamin F there was but 1 copulation in 55 attempted matings. This confirms the earlier conclusion of Burr and Burr (*E. S. R.*, 63, p. 595) that loss of sex interest takes place much earlier in male rats deprived of unsaturated fatty acids than in those deprived of vitamin E. Histological examination of the testes of some of the sterile animals showed extensive morphological impairment. Contrary to results with vitamin E, however, regeneration of the epithelium of some of the tubules and restoration of fertility resulted on adding the essential fatty acids to the diet. "Thus in its amenability to a remedial diet, impairment of the male reproductive function due to deficiency in vitamin F resembles the impairment due to the deficiency of vitamin A and is in contrast with impairment from lack of vitamin E. We can now state that in the case of vitamins A and F, structural and functional restoration results from curative feeding of the required vitamin after the existence of sterility has been proved, while restoration is much more difficult or impossible to achieve after proved sterility supervenes from deficiency in vitamin E."

Organic acids and the acid base relationship: Oxalic acid in foods, E. F. KOHMAN (*Jour. Amer. Dietet. Assoc.*, 10 (1934), No. 2, pp. 100-106).—The purpose of this general discussion is to correct certain misapprehensions concerning the possible danger from oxalic acid as it occurs naturally in foods. "Its universal occurrence makes it certain that we are eating daily more or less oxalic acid in the form that occurs in foods, and there is no indication that, under normal conditions, this results in anything but normal consequences. Oxalic acid eliminated by the body, whether originating from ingested food or from normal digestive processes, takes with it an equivalent quantity of calcium, but the amount of calcium so lost is normally insignificant. An adequate supply of calcium is more logically assured by proper choice of calcium-bearing foods than by being unduly concerned with the amount of oxalic acid in the diet."

A table is given of the reported oxalic acid content of a number of foods, chiefly fruits and vegetables.

The normal serum-calcium and magnesium of the rat: Their relation to sex and age, E. WATCHORN (*Biochem. Jour.*, 27 (1933), No. 6, pp. 1875-1878).—A statistical study is reported of serum calcium and serum magnesium values obtained on approximately 100 presumably normal rats grouped as young (3-4 mo. old) and adult (8½-16 mo. old) and further grouped by sex. "Young rats had a slightly, but probably significantly, higher serum calcium level than adult animals. The females had a slightly lower serum calcium level than the

males. The difference was not definitely significant. The average serum magnesium of adult males and of young and adult females was the same (4.4 mg per 100 cc), but young males had a significantly higher average (5.36 mg per 100 cc). There was no seasonal variation in either mineral with the diet used."

Studies on magnesium deficiency in animals.—IV, Reaction to galvanic stimuli following magnesium deprivation, H. D. KRUSE, M. M. SCHMIDT, and E. V. MCCOLLUM (*Amer. Jour. Physiol.*, 105 (1933), No. 3, pp. 635-642, fig. 1).—In this continuation of the series of papers noted previously (E. S. R., 70, p. 560), a further proof that the effect of magnesium deficiency in rats upon the nervous system is a form of tetany is afforded by the results of determinations of the reactivity to galvanic stimuli of normal and magnesium-deficient rats.

"By restriction to a magnesium-deficient ration the rat's threshold of sensitivity to electrical stimuli is lowered, since very weak currents elicit a neuromuscular response. Such hyperirritability, detectable in measurable units by the electrical method, satisfies the criterion for the diagnosis of tetany as a manifestation of magnesium deficiency. When determined by electrical reactions, the time at which hyperirritability appears corresponds to that previously ascertained by use of auditory stimuli."

Studies on magnesium deficiency in animals, V, VI (*Jour. Biol. Chem.*, 106 (1934), No. 2, pp. 553-593, fig. 1).—In continuation of the series of studies noted above, two papers are presented.

V. Changes in the mineral metabolism of animals following magnesium deprivation, H. D. KRUSE, M. M. SCHMIDT, and E. V. MCCOLLUM (pp. 553-572).—Data are reported and discussed on the excretion of calcium, phosphorus, and magnesium in dogs following deprivation of magnesium.

The course of calcium metabolism was marked by progressively increasing retention during the first period of the deficiency, followed rather abruptly by increasing elimination. The elimination of phosphorus was irregular but never excessive, and that of magnesium decreased fairly regularly during the entire period.

During the first period the retention of calcium and phosphorus was entirely, and that of magnesium largely, due to a markedly diminished output in the feces. Magnesium alone showed diminished output in the urine. The increased excretion of calcium in the later stages of the magnesium deficiency was due to greater excretion in the feces.

"It is suggested that the calcium retention in the early stages of the deficiency is due to the antagonism known to exist between calcium and magnesium. The breakdown in calcium retention is due in all probability to nutritive failure. The progressively increasing excretion of nitrogen, taken in conjunction with previously reported terminal increase in nonprotein nitrogen values of the blood, is likewise attributed to the failure of nutritive processes."

VI. Chemical changes in the bone, with associated blood changes, resulting from magnesium deprivation, E. R. ORENT, H. D. KRUSE, and E. V. MCCOLLUM (pp. 573-593).—This paper reports a study of the distribution of calcium, phosphorus, and magnesium in the bones of young rats in progressive stages of magnesium deficiency.

During the course of the deficiency the bones increased rapidly in weight and in absolute content of ash, calcium, and phosphorus. The increase in calcium was much greater than in magnesium or phosphorus, resulting in bones of entirely different composition. The increased rate of calcium deposition took place chiefly in the first 5 days, after which the rate of increase was similar to that in the bones of normally fed rats. The rate of deposition of magnesium in the bones throughout the entire period was much slower than that of the

other two elements but more even, indicating a redistribution of the elements throughout the body. Immediately before the convulsions the magnesium level rose in the blood and dropped sharply in the bones.

The rôle of copper in carbohydrate metabolism, H. L. KEIL and V. E. NELSON (*Jour. Biol. Chem.*, 106 (1934), No. 1, pp. 343-349, figs. 4).—Glucose tolerance tests were conducted on anemic rats before and after the administration of iron alone and iron and copper (1 mg and 0.1 mg daily, respectively).

The curve for the animals receiving iron alone for 10 days did not differ from that of the anemic animals before feeding the supplement, but the curve for the animals receiving both iron and copper for the same length of time showed a significant lowering of the maximum point. Inasmuch as the hemoglobin values had not changed, the effect is thought to be due to a hitherto undescribed property of copper. "The most logical explanation seems to involve an improvement in liver function to bring about an acceleration of glycogen formation and thus a rapid removal of glucose from the blood. Unpublished data, obtained in this laboratory from anemic rat urine, show no impairment of pancreatic activity. The possibility of a direct oxidation catalyzed by copper either in the blood stream or in muscular tissue is overruled, provided that glucose is assumed to be the only reducing agent in anemic blood."

The distribution of iron in tissues, particularly liver, during peptic digestion and autolysis, W. D. MCFARLANE (*Jour. Biol. Chem.*, 106 (1934), No. 1, pp. 245-266, figs. 10).—The distribution of iron and copper in adult rat liver was studied by perfusing the liver immediately following excision with iron- and copper-free isotonic salt solution, reducing the material to a pulp, drying, and estimating the iron colorimetrically as ferric thiocyanate and the copper by means of the author's carbamate reagent (E. S. R., 70, p. 12). Available iron was determined by the Hill bipyridine test (E. S. R., 64, p. 712). The results obtained are summarized as follows:

"Approximately one-half (43 to 60 percent) of the iron in perfused rat liver tissue is in nonhematin form insofar as it reacts with bipyridine after reduction with sodium hydrosulfite. The total iron in a trichloroacetic acid filtrate reacts directly with potassium thiocyanate in acid solution after oxidation with hydrogen peroxide. The iron in this fraction accounts for only about 40 percent of the nonhematin iron. About 50 percent of the total iron in the trichloroacetic acid filtrate is precipitated along with organic substances by normal lead acetate. All of the copper in liver tissue is contained in the trichloroacetic acid filtrate and reacts directly with sodium diethyldithiocarbamate."

Fetal calf liver, adult rat liver and muscle tissue, and beef spleen were digested by pepsin at about pH 2 and also subjected to autolysis. The pepsin digestion produced a fivefold increase in the iron content of the trichloroacetic acid filtrate. The autoproteolytic changes in the liver and spleen at pH 5 involved decomposition of organic iron-containing compounds. This was accelerated by hydrogen sulfide and inhibited by copper. During prolonged autolysis a recombination of iron with organic substances took place.

Constancy of iron in the blood plasma and urine in health and in anemia, A. MARLOW and F. H. L. TAYLOR (*Arch. Int. Med.*, 53 (1934), No. 4, pp. 551-560, figs. 4).—A modified thiocyanate method applicable to the determination of iron in relatively small samples of blood plasma and urine (lower limit of accuracy 0.002 mg of iron) is described, and data are reported on the iron content of the blood plasma and urine of 5 normal persons, 3

patients with hypochromic anemia due mainly to chronic loss of blood, and 2 patients with pernicious anemia soon after remissions. Hemoglobin and red blood cell determinations were also made.

The range of iron values for the normal subjects was between 0.4 and 0.7 mg for the blood plasma and from 0.03 to 0.8 mg per 24 hr. for the urine. The values for the anemic patients fell within these normal limits. The oral administration of ferric ammonium citrate to the patients and the normal subjects caused no appreciable increase in the iron content of either the blood plasma or the urine. The 3 patients with hypochromic anemia showed prompt response in hemoglobin and reticulocytes following the iron treatment, and there was also a slight response in the pernicious anemia patients.

Iron therapy: A routine procedure during infancy, H. L. EDER (*Arch. Ped.*, 51 (1934), No. 11, pp. 701-713).—This paper discusses the advisability of giving iron routinely during infancy, with illustrations from the author's clinical experience in the use of an iron cod-liver oil mixture in the treatment of known anemias. The author feels that if orange juice and cod-liver oil are recommended as routine procedures to prevent deficiency diseases and to improve the general health of infants, "some form of iron therapy is even more vitally necessary to maintain proper nutrition."

Toxicity of naturally occurring arsenic in foods, E. J. COULSON, R. E. REMINGTON, and K. M. LYNCH (*Science*, 80 (1934), No. 2071, pp. 230, 231).—Data are reported on the storage of arsenic in the bodies of rats during periods of 3 and 5½ mo. on diets of varying arsenic content derived from shrimp and from added arsenic trioxide.

The bodies of the animals which had received the largest amount of arsenic, 17.9 mg per kilogram, in the form of shrimp, contained at least 4 times as much arsenic as the stock diet controls, while those which had received approximately the same quantity of arsenic as arsenic trioxide contained from 55 to 65 times as much as the controls. An even greater difference between the storage of arsenic on the two forms was shown during the first 3 mo. than after 5½ mo., suggesting that the rats receiving the inorganic arsenic had at some period during the first 3 mo. reached an equilibrium, after which no further storage was taking place.

"There was no retardation of growth in any of the arsenic-fed animals nor any observable differences in their physical vigor or appearance, and in none of them was there any histological evidence of injury to the spleen, liver, or kidney due to the feeding of arsenic at the levels here employed."

Comparative toxicity of fluorine compounds, M. C. SMITH and R. M. LEVERTON (*Indus. and Engin. Chem.*, 26 (1934), No. 7, pp. 791-797, figs. 4).—In continuation of the extensive investigation of the harmful effects of fluorine as tested on rats (*E. S. R.*, 72, p. 726), the authors have studied the effects upon growth, food utilization, mortality, and teeth of various fluorine compounds administered in concentrations of fluorine of from 0.000175 to 1.8 percent of the ration to male rats over a period of 6 weeks from weaning.

It required 10 times as much fluorine in the form of cryolite and 20 times as much in the form of calcium fluoride to produce the same degree of slight retardation of growth as caused by 0.0226 percent fluorine as sodium fluoride. For severe stunting of growth the differences between the amounts of the various fluorine compounds required were even greater. The relative amounts of fluorine required for death in from 9 to 11 days were 0.0904 percent as sodium, potassium, or ammonium fluoride, 3.6 percent as cryolite, and 5.4 percent as calcium fluoride. For the more severe type of tooth damage, at least 10 times as much fluorine from cryolite and 20 times as much from calcium fluoride as from the more solu-

ble compounds were required, but for the first indication of tooth disorder, as noted in the previous paper, the same fluorine concentration was required of all the compounds, 0.0014 percent of the diet, or 1 mg per kilogram of body weight when fed separately.

The special significance of these findings is thought to lie not in the differences in toxicity of the various fluorine compounds at higher levels, but in the harmful effect on the teeth of fluorine in any form at very low levels, such as might be present in unwashed fruit sprayed with fluorine compounds.

Is the effect of fluorine on teeth produced through the parathyroid glands? H. M. HAUCK, H. STEENBOCK, and H. T. PARSONS (*Amer. Jour. Physiol.*, 103 (1933), No. 2, pp. 480-488).—The feeding of sodium fluoride to rats in doses of 0.15 percent of rations of varying calcium content was found to produce no demonstrable histological changes in the parathyroid glands. As determined by growth, the toxic effect of the sodium fluoride was less on a high calcium than a low calcium ration. On the low calcium ration the toxicity was reduced by the administration of vitamin D, but there was no effect on a high calcium ration.

The effect of the level of calcium intake on the calcification of bones and teeth during fluorine toxicosis, H. M. HAUCK, H. STEENBOCK, and H. T. PARSONS (*Amer. Jour. Physiol.*, 103 (1933), No. 2, pp. 489-493).—The bones of the rats in the study noted above were analyzed for total ash and calcium. "On a diet low in calcium and on a stock diet of moderate calcium content the ash content was decreased absolutely and percentagely. On a high calcium rachitogenic diet it was definitely increased. However, the total ash in the incisor teeth was decreased in all cases. It was found impossible to correlate these results with any consistent change in the amount of inorganic Ca and P in the blood sera."

Present knowledge concerning the biology of the vitamins [trans. title], H. KREITMAIR (*Ztschr. Vitaminforsch.*, 3 (1934), No. 2, pp. 105-107).—A brief summary is given of the physiological effects of deficiencies and in some cases of excesses of the various vitamins.

[Vitamin studies at the Pennsylvania Station], R. A. DUTCHER and N. B. GUERRANT (*Pennsylvania Sta. Bul.* 308 (1934), p. 8).—This progress report summarizes the findings in studies of the effect of various methods of pasteurization on the content of vitamins B and G in milk and of mineral oil on the adsorption of carotene and vitamin A from the digestive tract of the rat.

The association of fat-soluble vitamins and antioxidants in some plant tissues, E. M. BRADWAY and H. A. MATTILL (*Jour. Amer. Chem. Soc.*, 56 (1934), No. 11, pp. 2405-2408).—In this investigation canned tomatoes, canned carrots, and wheat germ oil were selected for attempts to isolate antioxidants on account of the stability of vitamin A in both vegetables, the presence of vitamin E in tomatoes and the exceptionally high content of vitamin E in wheat germ oil. The methods of separating the unsaponifiable constituents were the same, with slight modification, as those employed in a previous study of lettuce (E. S. R., 66, p. 608). The various fractions after removal of the solvents were tested for antioxidants and vitamin E by methods described elsewhere (E. S. R., 65, p. 205; 71, p. 731).

The results for vitamin E are given in terms of minimum dosage required to cause successful gestation in rats on a sterility-producing diet. The amount of vitamin E found in the carrots was very small, for it required 220 g of canned carrots or 25 g of dried carrots to prevent resorptions. Five g of the whole dried tomato proved to be the minimum dosage for vitamin E. The distribution of vitamin E in the different fractions was approximately the same for lettuce,

carrots, tomatoes, and wheat germ oil. The diphasic separation between 92 percent methyl alcohol and petroleum ether segregated the vitamin in the latter. The antioxidants, however, appeared to be different in the four materials as shown by differences in their distillation ranges under reduced pressure and from the fact that in wheat germ oil the antioxidant is soluble in petroleum ether.

Lycopin was separated from tomatoes and found to be inactive as a source of vitamins A and E and to act as a prooxidant.

Salmon liver and salmon egg oils; Vitamin content and chemical and physical properties, C. F. LEE and C. D. TOLLE (*Indus. and Engin. Chem.*, 26 (1934), No. 4, pp. 446-449, figs. 8).—The chemical and physical characteristics and the vitamin A and D content, as determined biologically, are reported for samples of oils prepared from the canned livers, trimmings, and eggs of various species of salmon from the Columbia and Fraser Rivers and Puget Sound.

Although in many cases the oils were fed in too small quantities to promote the standard rate of growth in the vitamin A tests, the data, compared with the results simultaneously obtained from a good grade of medicinal cod-liver oil, are thought to indicate that the salmon-liver oils are from 5 to 20 times as potent in vitamin A and about twice as potent in vitamin D as cod-liver oil. The oil from a sample of Columbia River blueback or sockeye salmon proved to be fully 3 times as potent as the cod-liver oil in vitamin D.

The oils from the eggs of the different species varied considerably in their content of both vitamins A and D, but in no case had a higher content of either of the vitamins than cod-liver oil.

The oils from the Chinook trimmings, both with and without the livers, gave good results for vitamin A, but the oils from the whole, the commercially canned, and the milt of the Chinook were low in vitamin A.

Vitamin studies on apples.—I, The Vitamins A, B, and C content of the Rome Beauty, Delicious, Stayman, Yellow Newtown, and Winesap, I. A. MANVILLE, A. S. MCMINIS, and F. G. CHUINARD (*Jour. Amer. Dietet. Assoc.*, 10 (1934), No. 2, pp. 135-152, fig. 1).—Using the same technic as in a previous study of the vitamin content of pears (E. S. R., 70, p. 565), the authors report the following values for apples: Vitamin A—Delicious 24, Rome Beauty 12, Stayman 18, Winesap 24, and Yellow Newtown 36 units per ounce; vitamin C—Delicious, Rome Beauty, Stayman, and Winesap 3 units per ounce each and Yellow Newtown 6 units; vitamin B (complex)—Yellow Newtown, Winesap, and Stayman 2 units each, Delicious 3, and Rome Beauty 5 units per ounce.

"A method is discussed for determining the vitamin A potency of a given material by finding the minimal protective dose (M.P.D.) of that material and ascribing to it a unitage of 2.4. Reasons are advanced for believing that apples may possess a substance, other than carotene, which possesses vitamin A activity. It is suggested that the vitamins A and C contents of the apple, for example, are more closely correlated with gene activity than with chromosome number; that the factors responsible for these vitamins appear to be separate series of duplicate genes whose inheritance is unknown. These genes apparently work cumulatively, since there is a tendency for triploids to show higher values than diploids."

Fundamental nutritive value of apples, C. R. FELLERS (*Mass. Fruit Growers' Assoc. Rpt.*, 40 (1934), pp. 181-183).—This progress report on the extensive investigation which is being conducted by the author and his associates at the Massachusetts Experiment Station includes, in addition to findings noted previously from other sources (E. S. R., 69, p. 903), a grouping of 20

varieties of apples in decreasing order of vitamin C content as follows: Group 1—very good, Baldwin and Northern Spy; group 2—good, Winesap, Spitzenburg, Roxbury Russet, Gravenstein, Ben Davis, and King; group 3—fair, Wealthy, Red Astrachan, Arkansas, Rhode Island Greening, and Cortland; and group 4—poor, Golden Delicious, King David, Tolman Sweet, Delicious, and McIntosh.

It is estimated that to satisfy all the vitamin C requirements of man would require 1 small apple daily from group 1, 2 apples from group 2, from $2\frac{1}{2}$ to 3 apples from group 3, and from 4 to 6 apples from group 4.

Assay of vitamin A. J. B. ORR and M. B. RICHARDS (*Nature [London]*, 133 (1934), No. 3355, p. 255).—In this preliminary report it is stated that measurements of the length of the body of the live animal and of the bones at post mortem of normal rats and of rats which had lost weight on vitamin A-deficient diets showed that when vitamin A is the only known factor absent from the diet there is no cessation in growth in the sense of increase in size. The characteristic loss in weight in vitamin A deficiency is attributed entirely to the pathological conditions arising from the deficiency. The diversity of these symptoms during the preliminary depletion period is considered to account for the well-known lack of uniformity in experimental animals at the beginning of the test period. This source of error is thought to make the curative method of vitamin A determination of doubtful value.

The cholesterol and vitamin A content of the liver in man: A study of one hundred and six livers obtained at autopsy, GULLI LINDH MULLER and M. M. SUZMAN (*Arch. Int. Med.*, 54 (1934), No. 3, pp. 405-411, fig. 1).—A statistical comparison of the data on the cholesterol and vitamin A content of the liver in 106 cases in which post-mortem examinations were made showed no significant relation between age (10 mo. to 81 yr.) and cholesterol content or between the cholesterol and vitamin A content. The cholesterol content was much more constant than the vitamin A content. The livers of 47 of the 106 cases had vitamin A values below 100 blue units per gram of liver tissue, including 12 showing complete absence of vitamin A. In 25 cases from the same group the cholesterol content was between 200 and 300 mg per 100 g. In one instance the vitamin A content of the liver was above 1,000 mg and the cholesterol content between 200 and 300 mg per 100 g.

The influence of massive doses of vitamin A in animals on a normal diet [trans. title], A. CHEVALLIER, L. CORNIL, and P. CHABRE (*Compt. Rend. Soc. Biol. [Paris]*, 115 (1934), No. 5, pp. 541-543).—Young rats on a normal diet were fed a vitamin A concentrate from cod-liver oil in doses of 80 mg per day, representing 3,200 times the protective dose, for a period of 45 days, at which time they were sacrificed for histological examination of the organs. There is no evidence of toxicity from these massive doses except a marked loss in weight toward the end of the period at a time when the controls were continuing to grow.

Guinea pigs were fed the concentrate in doses of 400 and 12.5 mg, respectively, during a period of 50 days. On the smaller dosage there was a marked gain in weight, and on the larger a gradual loss in weight and the animals presented a miserable appearance.

These findings are thought to show that animals such as rats and guinea pigs on a normal diet providing an abundance of vitamin A are capable of handling for a long time massive doses of vitamin A, after which the limits of tolerance are exceeded. Doses considerably lower, but yet 100 times larger than the normal dose, are well tolerated.

The influence of massive doses of vitamin A on depleted animals [trans. title], A. CHEVALLIER, L. CORNIL, and P. CHABRE (*Compt. Rend. Soc. Biol.*

[Paris], 115 (1934), No. 5, pp. 543, 544).—The feeding experiments noted above were repeated with rats which had shown the first signs of depletion of their vitamin A reserves. On the smaller dose of the vitamin A concentrate growth was rapid, with recovery from the symptoms of deficiency, but on the massive dose the symptoms of deficiency became greatly aggravated and death followed in from 3 to 4 weeks. Guinea pigs were fed a vitamin A-free diet supplemented from the start with 400 mg per day of the vitamin A concentrate. The animals began to lose weight almost immediately and died in from 15 to 16 days with signs of intestinal hemorrhages and with marked loss in fur. Controls on the basal diet lacking in vitamin A died with similar symptoms but after a much longer time, from 30 to 35 days.

These findings are thought to show that tolerance to massive doses of vitamin A is considerably diminished in animals subsisting on a diet completely deficient in the vitamin, or at least one completely lacking in green vegetables.

The transformation of carotene into vitamin A in the human body [trans. title], W. V. DRIGALSKI (*Ztschr. Vitaminforsch.*, 3 (1934), No. 1, pp. 37-74, figs. 2).—An extensive review of the literature on the subject is followed by the report of studies by the author on the carotene content of the blood of human subjects during the course of experimental carotenemia induced by the ingestion of considerable amounts of carrot juice and eggs, and on the vitamin A content, as determined biologically, of various organs, secretions, and excretions in human subjects.

The carotene content of human blood was found to vary widely. In subjects showing no carotene, or only traces, before the ingestion of large amounts, there was quite a time lag before the appearance of significant amounts in the blood. The highest concentration reached was 0.27 mg percent. Negative results for vitamin A were obtained with the cerebrospinal fluid, perspiration, semen, bile, feces, and urine and slightly positive results with the ascitic fluid.

The author concludes that after the body's need for vitamin A has been met the excess is not excreted as such, but is broken down. This breakdown of vitamin A is thought to take place chiefly in the liver.

Nearly 300 references to the literature are given.

The biological activity of some carotene preparations, H. N. HOLMES, R. CORBET, H. CASSIDY, C. R. MEYER, and S. I. JACOBS (*Jour. Nutr.*, 7 (1934), No. 3, pp. 321-329, fig. 1).—The feasibility of administering carotene as a source of vitamin A adsorbed on silica gel, norite carbon, and alumina was tested by using these adsorbates in curative tests on vitamin A-deficient rats.

The best results were obtained with the alumina adsorbates containing relatively large amounts of carotene. The silica gel and norite carbon adsorbates were ineffective. That this was due not entirely to the inability of the rats to utilize the carotene thus adsorbed, but rather to destruction of the activity of the carotene on adsorption by these reagents, was demonstrated in feeding tests with carotene adsorbed from the various adsorbing agents. The carotene removed from alumina had lost none, that from silica gel some, and that from norite carbon all of its biological activity.

Some evidence was presented indicating that the rat does not utilize all of the carotene fed whether the amount be small or large.

The fate of carotene introduced into the circulation, J. C. DRUMMOND, H. P. GILDING, and R. J. MACWALTER (*Jour. Physiol.*, 82 (1934), No. 1, pp. 75-78).—In continuation of attempts to determine the fate of carotene in the animal body (E. S. R., 72, p. 280), carotene was introduced into the circula-

tion of cats in the form of a colloidal suspension in water of a concentration of 10 mg per 100 cc. The infusion was made into the internal saphenous vein at the rate of about 1 cc per minute. At intervals during the infusion, samples of blood were withdrawn from the carotid cannula, and finally the animals were bled to death and the main bulk of the blood and various organs were examined quantitatively for carotene.

No trace of carotene could be detected in any of the blood samples, and of the organs examined only the liver, lungs, and spleen contained measurable quantities, with the liver containing by far the largest amount. The total recovery in the 5 animals ranged from 82.6 to 87.6 percent. Gross sections of the liver cut by a Valentine knife immediately after removal from the body showed on microscopic examination that granules of deeply colored material were present in Kupffer cells, chiefly at the periphery of the lobules. This is thought to be convincing evidence that the reticulo-endothelial system operates to absorb the particles of the pigment from the circulation.

The effect of vitamin A deficiency on the concentration of the blood lipids of albino rats, M. E. SMITH (*Jour. Nutr.*, 8 (1934), No. 6, pp. 675-687; *abs. in Arkansas Sta. Bul.* 312 (1934), pp. 39, 40).—Ten groups of three litter mate rats each were fed a normal diet ad libitum, a vitamin A-deficient diet, and a normal diet limited in quantity to that consumed by the litter mate on the vitamin A-deficient diet, respectively. Blood samples taken at intervals until the vitamin A-deficient animals were dying were analyzed for fatty acids, cholesterol, and lecithin.

The concentration of all of these constituents was significantly higher in the vitamin A-deficient animals than in the controls until the next to the last bleeding, when the lecithin remained high in the A-deficient animals, but the other values dropped below those of the controls. At the final bleeding the blood cholesterol and fatty acids were highest in the calorie control, and all three values for the A-deficient animals showed a decided drop.

In the females cornified cells were evident in vaginal smears from 7 to 15 days before the appearance of ophthalmia.

Can the evolution of avitaminosis A be influenced by the nature and quantity of protein in the basal diet? L. RANDOIN and S. QUEUILLE (*Compt. Rend. Acad. Sci. [Paris]*, 198 (1934), No. 22, pp. 1942-1944, figs. 2).—A comparison is first reported of the effect upon rats of three basal vitamin A-free diets: (1) The diet ordinarily used in the authors' laboratory, consisting of meat peptone 17, dried brewery yeast 3.5, dextrin 63.5, peanut oil 12, and salt mixture 4 parts, (2) the same meat diet with the peptone replaced by an equal amount of casein, and (3) a similar diet in which 18 percent of dried yeast was the sole source of protein.

In all three groups of rats the avitaminosis followed the same course, xerophthalmia and loss of weight occurring about 25 days after the beginning of the experiment.

In two series of experiments, comparisons were made of casein at levels of 17, 27, and 37 percent of the diet, the casein being untreated in one series and washed with acetic acid in the other. On the two higher levels of either form of casein xerophthalmia was not prevented, but loss of weight was retarded and the survival period prolonged. This is attributed not to possible traces of vitamin A in the casein, but to the presence of an unknown factor or the possibility that in the presence of large proportions of casein only relatively small quantities of vitamin A are needed.

Do carbohydrates favor the evolution of experimental xerophthalmia? [trans. title], G. MOURIQUAND and P. CHAIX (*Compt. Rend. Soc. Biol.*

[*Paris*], 115 (1934), No. 5, pp. 538-540).—Alterations in the proportions of carbohydrate in a vitamin A-deficient diet were found to have no effect upon the time of onset of symptoms of xerophthalmia in young rats subjected to the deficient diet at the age of 30 days.

The international standard of vitamin B₁: Determination of the exact value of its biological activity with the adult pigeon as the experimental animal [trans. title], L. RANDOIN (*Bul. Soc. Chim. Biol.*, 16 (1934), No. 3, pp. 440-447, figs. 5).—In standardizing the author's physiological vitamin B₁ unit against the international standard, the preventive technic with adult pigeons was adopted as the most satisfactory method. The importance is emphasized of using a basal ration complete except for the B vitamins instead of polished rice in pigeon tests. The ration used consisted of casein 6 percent, fibrin 5, egg albumin 5, butterfat 4, and dextrin 66 (all purified), Osborne and Mendel salt mixture 4, agar 8, and filter paper 2 percent. The minimum dosage of the international standard was established as 75 mg, corresponding to 7.5 international units.

Attention is called to the fact that the standard contains nonnegligible amounts of vitamins B₂ and B₃, which may not be present in the same proportions in other materials.

Further investigations concerning the new vitamin B growth-promoting factor for rats found in whole wheat, N. HALLIDAY (*Jour. Biol. Chem.*, 106 (1934), No. 1, pp. 29-40, figs. 3).—In this investigation at the Michigan Experiment Station, the author, with the assistance of L. Dennett, prepared a crystalline concentrate of the new factor previously demonstrated in whole wheat (E. S. R., 69, p. 152) and compared its physical, chemical, and physiological properties with the vitamin B₄ of Reader (E. S. R., 64, p. 195). After testing various fractions of wheat, bran was selected as the material to use in the fractionation, as it was lower than the germ in vitamin B potency but contained nearly as much of the new factor. Ether, dilute alcohol, and dilute acid were all tested as solvents for preparing an extract for fractionation. Ether removed very little of the factor and 50 percent alcohol yielded a very gummy extract. The most satisfactory results were obtained by shaking bran for 2 hr. with acidified water at about pH 4 in the proportion of 1 kg of bran to 8 l of water. In preparing the concentrate from this extract, the method of Peters and associates was followed with slight modification (E. S. R., 70, p. 153). Minor changes were also made in the author's technic for testing for vitamin B₄.

A crystalline product was obtained which in many respects showed close similarity to vitamin B₄ but differed from it in too many respects to warrant definite conclusions as to the identity of the two factors. The possibility is suggested that the differences may be due to the fact that one or the other of the two products may be associated with impurities or contaminating substances.

The effect of a deficiency of vitamin B upon the central and peripheral nervous systems of the rat, C. O. PRICKETT (*Amer. Jour. Physiol.*, 107 (1934), No. 2, pp. 459-470, figs. 9).—This contribution from the Alabama Experiment Station reports studies of the nervous tissues of rats on diets free from vitamin B but containing adequate amounts of vitamin G. The observations include symptomatology, gross findings, and microscopic findings in the peripheral and central nervous systems.

Contrary to several observations in the literature, vitamin B was found to produce no characteristic changes in the peripheral nervous system but to produce very definite changes in the central nervous system. These consisted first of disseminated foci of hemorrhage or intense congestion, followed by cellular damage varying in degree with the length of time the animal was left on experi-

ment. Of the areas most consistently affected, several are the centers for the equilibratory control of the muscles and another is concerned with the transmission of gustatory impulses from the tongue. The author is of the opinion that these symptoms are not the result of actual structural change in the nerve cells, but simply locate the functional disturbances which produce the symptoms of vitamin B deficiency.

Hyperthyroidism and nutrition.—I, Vitamin B and thyroxin, B. SURE and M. E. SMITH (*Jour. Nutr.*, 7 (1934), No. 5, pp. 547-555, figs. 8; *abs. in Arkansas Sta. Bul.* 312 (1934), pp. 7, 8, 39).—In this contribution from the Arkansas Experiment Station, it is shown that vitamin B exerts a protective influence against experimental hyperthyroidism in rats.

"The fact that in experimental hyperthyroidism protection can be afforded by a highly concentrated vitamin B preparation would suggest that oral or preferably parenteral administrations of potent standardized vitamin B concentrate may be indicated in toxic goiter, particularly in nonoperative cases. This is, however, a problem for the clinician to solve."

The vitamin C content of human tissues, M. YAVORSKY, P. ALMADEN, and C. G. KING (*Jour. Biol. Chem.*, 106 (1934), No. 2, pp. 525-529).—Using the method of direct titration previously described (E. S. R., 71, p. 137), the authors have determined the distribution of vitamin C in human tissues obtained in 67 hospital autopsies. The results, which are tabulated by age groups and by typical variations for different tissues, show the following order of decreasing concentration: "Adrenal, brain, pancreas, liver, spleen, kidney, lung, heart, muscle. In the younger age groups the thymus content was about as high as that of the pancreas. The average values ranged from about 0.55 mg per gram for adrenal tissue down to about 0.04 mg for heart tissue. Individual cases varied from approximately 3 times higher than the average down to less than one-tenth the average values. The average for each of the tissues from those under 10 yr. of age was distinctly higher than those over 10 yr. of age. Approximately 20 percent of the cases gave evidence of a condition of latent scurvy."

The vitamin C content of human tissues (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 21, pp. 1626, 1627).—Editorial comment on the study noted above.

Formation of intercellular substance by the administration of ascorbic acid (vitamin C) in experimental scorbutus, V. MENKIN, S. B. WOLBACH, and M. F. MENKIN (*Amer. Jour. Path.*, 10 (1934), No. 5, pp. 569-576, pls. 3).—The earlier experiments of Wolbach and Howe (E. S. R., 55, p. 388) have been repeated, using crystalline ascorbic acid in place of orange juice with identical results as regards the histological repair of intercellular substance observed in sections of the costochondral junctions and incisor teeth.

These findings furnish additional evidence that ascorbic acid is identical with vitamin C, and indicate that the deposition of intercellular substance is controlled by this relatively simple chemical substance. The possible mechanism of the reaction is discussed with reference to recent literature dealing with the function of ascorbic acid as an activator of enzyme action.

In the course of preparing crystalline ascorbic acid from lemon juice by the method of King and his coworkers (E. S. R., 69, p. 774), certain precautions were found essential. In the final step of the extraction, crystallization of the ascorbic acid was found more effective when the material was kept at -20°C . for several days. It was also found that losses in potency during the isolation process could be largely prevented by bubbling CO_2 through the material during the various evaporations in vacuo.

Ascorbic acid (vitamin C) and intoxications [trans. title], E. HARDE (*Compt. Rend. Acad. Sci. [Paris]*, 199 (1934), No. 13, pp. 618-620).—The adrenal capsules of 18 guinea pigs which had died of diphtheritic intoxication were found to resemble those of scorbutic guinea pigs in their lessened reaction to silver nitrate. Mice which had proved refractory to from 1 to 10 lethal doses for guinea pigs of diphtheria toxin were killed on the fourth day and their adrenal capsules tested with silver nitrate with positive results.

Guinea pigs were injected with diphtheria toxin and then treated by subcutaneous or intraperitoneal injection of ascorbic acid neutral to litmus, together with 10 mg by mouth. This was followed once or twice in the next 6 or 8 days by from 15 to 20 mg ascorbic acid by mouth. Controls receiving no ascorbic acid were dead in from 4 to 10 days, but the majority of the animals receiving the acid survived. These showed massive induration and scarring at the site of the injection, suggesting that the ascorbic acid neutralized the toxin locally.

It is also noted that ascorbic acid in amounts of 10 mg per lethal dose of diphtheria toxin neutralized in vitro after an hour's contact two lethal doses of the toxin, and that in mice which had succumbed to infection by mouth with *Bacillus typhi murium* the adrenal cortex contained no ascorbic acid.

These observations, although admittedly incomplete, are thought to indicate that ascorbic acid has a protective role in the resistance toward a certain number of infections and intoxications, particularly those which cause lesions of the adrenal cortex and gastro-intestinal tract.

Human daily requirements of dietary ascorbic acid, G. GÖTHLIN (*Nature [London]*, 134 (1934), No. 3389, pp. 569, 570).—It is noted briefly that through a comparison of the minimum amount of antiscorbutic required by a guinea pig for protection against microscopic alterations in the teeth and the minimum amount required by man to prevent prescorbutic reduction in the strength of the cutaneous capillaries, it has been established that an adult weighing 60 kg requires a daily dose of an antiscorbutic (orange juice) from 14 to 20 times as large as a guinea pig weighing $\frac{1}{3}$ kg. These observations have been used to establish indirectly the human daily requirement of ascorbic acid by feeding guinea pigs graded doses of ascorbic acid, increasing regularly by 35 percent from 0.4 to 6 mg daily.

At the end of the experimental period of 50 days, it was found that the minimum quantity of ascorbic acid capable of preventing microscopic alterations of the teeth was 1.33 mg and the minimum quantity necessary to prevent macroscopic scorbutic changes 0.5 mg. From these results it is estimated that the smallest daily dose of ascorbic acid which will protect a 60-kg man against the slightest reduction in capillary strength is from 19 to 27 mg.

Disturbances of reproduction and ovarian changes in the guinea-pig in relation to vitamin C deficiency, M. M. KRAMER, M. T. HARMAN, and A. K. BRILL (*Amer. Jour. Physiol.*, 106 (1933), No. 3, pp. 611-622, pls. 2).—In this investigation at the Kansas Experiment Station, female guinea pigs fed the Sherman, LaMer, and Campbell vitamin C-free diet supplemented with 1, 3, or 5 cc of orange juice or tomato juice failed to give birth to living young. The pregnancies were fewer than normal, and none occurred when less than 3 cc of either orange juice or tomato juice was fed daily. Abortions or resorptions occurred whether pregnancy had taken place before or after the animals were placed on the experiment. "The ovaries of these animals varied from the normal in that there was a degeneration of the Graafian follicles and a lack of normal development of new Graafian follicles. In the extreme cases of the

degeneration of the Graafian follicle there was neither a discus proligerus nor a stratum granulosum."

Practical scorbutic diet No. 3 from rolled oats and dried milk [trans. title], V. DEMOLE (*Ztschr. Vitaminforsch.*, 3 (1934), No. 2, pp. 89-91; *Fr., Eng. abs.*, pp. 90, 91).—The basal scorbutic diet for guinea pigs described consists of rolled oats 2 kg, dried whole milk previously heated to 120° C. for 2 hr. 1 kg, and the whites of 6 eggs, the whole made into a paste with water, formed into cakes of about 5 cm diameter, and baked for from 20 to 25 min. on a tin greased with olive oil. In addition to the cakes, which are said to be relished by guinea pigs, from 0.1 to 0.2 cc of cod-liver oil is administered twice a week. The animals are said to be ready for the test in from 10 to 16 days. Negative controls die in from 3 to 4 weeks, and positive controls grow at a normal rate on the diet supplemented with 1.5 cc of fresh orange juice or 1 cc of a 1 percent solution of ascorbic acid.

The international standard of vitamin D: Determination of the exact value of its biological activity [trans. title], L. RANDOIN (*Bul. Soc. Chim. Biol.*, 16 (1934), No. 3, pp. 428-439, pls. 2, figs. 2).—The provisional international vitamin D standard of irradiated ergosterol in oil was found to cure rickets in rats on the rachitic diet of Randoin and Lecoq (*E. S. R.*, 60, p. 197) in from 10 to 12 days in doses of 0.5 γ or 5 units. The minimal curative dose of any material, according to the author's technic, is thus established as 5 international units.

The technic of preparing the basal diet and conducting the tests is described in detail, and attention is called to the importance of conducting the tests simultaneously on several lots of animals of the same weight with a perfectly homogeneous diet of constant composition and under experimental conditions maintained as uniform as possible. It is considered to be equally necessary to use control animals and to make comparative tests by the curative and preventive methods. In the X-ray examinations photographs were taken of the tail as well as the tibia. The calcification of the coccygeal vertebrae on unsupplemented and vitamin D-supplemented rachitic diets is thought to furnish as interesting and precise results as that of the bones.

Occurrence of antirachitic vitamin in green plants, O. RYGH (*Nature [London]*, 133 (1934), No. 3355, p. 255).—It is reported briefly that meadow hay grown in southern Norway during an exceptionally sunny season and rapidly dried by a special quick-drying process brought about satisfactory cure of rickets in rats following the method of Poulsson and Lövenskiöld (*E. S. R.*, 59, p. 293) in daily doses of 4 mg of an ether extract. The extract thus corresponds in potency to a high grade cod-liver oil and represents a value of 11 units (Oslo) of vitamin D per gram of the hay powder.

Of the unsaponifiable fraction of the ether extract, 20 mg was required to produce the same effect as 4 mg of the whole extract. This is thought to show that the vitamin D in the hay and presumably in green plants in general has the same characteristics as described by Kon and Booth (*E. S. R.*, 71, p. 685) for butter, rather than those of cod-liver oil.

The third vitamin D, O. RYGH (*Nature [London]*, 133 (1934), No. 3362, p. 533).—In extension of the study noted above, the saponifiable fraction of the ether extract of butter or hay was treated with a small excess of acetic acid and the free fatty acids were taken up with ether and isolated. "It was then found that the missing four-fifths of the original vitamin D were among the free fatty acids. Thus with alkali it gives a water-soluble substance; deprived of alkali, it is again soluble in ether."

On shaking melted butterfat (dried with sodium sulfate) with a like amount of warm ethyl alcohol, 4 percent of the butterfat dissolved in the alcohol. This fraction was active in curative daily doses of 20 mg. showing it to be 15 times as active as the original butter. The unsaponifiable matter remaining after two saponifications was found to contain about one-fifth, and the saponifiable fraction four-fifths of the vitamin. A similar distribution of the vitamin in the unsaponifiable and saponifiable fractions was obtained with the ether extract of meadow hay and also with cow's liver, while with the ether extract of human liver two-thirds of the vitamin was found in the unsaponifiable matter and only one-third in the free fatty acid fraction.

The third vitamin D [trans. title], O. RYGH (*Ztschr. Vitaminforsch.*, 3 (1934), No. 3, pp. 164-167; *Eng., Ger. abs.*, pp. 166, 167).—This paper is essentially noted above. The author suggests that the third form of vitamin D be designated vitamin D_c.

Demonstration of the existence of two forms of vitamin D in fish liver oils, C. E. BILLS, O. N. MASSENGALE, and M. IMBODEN (*Science*, 80 (1934), No. 2086, p. 596).—The authors note briefly that fish oils differ qualitatively, as well as quantitatively, in their vitamin D content as determined by administering to chickens equivalent amounts for rats of the oils under comparison. Halibut-liver oil and cod-liver oil, rat unit for rat unit, were found not to differ appreciably, but the liver oil of the bluefin tuna (*Thunnus thynnus*), which contains on the average 40,000 international units of vitamin D per gram, proved to be only one-sixth as effective as cod-liver oil, rat unit for rat unit, when tested on chickens. The unsaponifiable fraction was likewise found to be one-seventh as effective as the unsaponifiable fraction of cod-liver oil.

"The effectiveness ratio, which was thus found to be 1:6 or 1:7, is several times greater than the probable error of the assays. One must, therefore, conclude that the vitamin D of bluefin tuna-liver oil and the vitamin D of cod-liver oil are different substances (or different mixtures of substances), one rat unit of the former having only 15 percent of the antirachitic effectiveness of one rat unit of the latter for the chicken."

Vitamin D in cacao shell, A. W. KNAPP and K. H. COWARD (*Analyst*, 59 (1934), No. 700, pp. 474-478, figs. 2).—This study was undertaken following the discovery of vitamin D in the cacao bean (*E. S. R.*, 69, p. 310). A sample of shells from fermented Gold Coast (Africa) beans was found to contain 28 international units of vitamin D per gram. It is noted that this value is exceptionally high for a vegetable product, and the question is raised as to whether or not vitamin D is produced by exposure to the sun during the drying of other fat-containing products such as copra, coffee, spice, oil-bearing seeds, and nuts.

Vitamins in canned foods.—XIV, Calcium and vitamin D in foods, E. F. KOHMAN, N. H. SANBORN, W. H. EDDY, and C. Z. GURIN (*Indus. and Engin. Chem.*, 26 (1934), No. 7, pp. 758-761, figs. 2).—This continuation of the series of papers noted previously (*E. S. R.*, 69, p. 619) reports an extension of the eleventh study of the series (*E. S. R.*, 67, p. 480), with emphasis on the question of the presence of vitamin D in ordinary foods. The authors conclude that ordinary foods contain significant amounts of vitamin D, and that the more satisfactory results which they have obtained in feeding mixtures of canned than of raw foods to rats through successive generations may be explained as due largely to the greater availability in the former of a limited calcium supply.

The provitamin D of cholesterol.—I, The antirachitic efficacy of irradiated cholesterol, J. WADDELL (*Jour. Biol. Chem.*, 105 (1934), No. 4, pp. 711-

739).—Following a brief review of the literature reporting anomalous results in the effectiveness of irradiated ergosterol and other antirachitic agents such as cod-liver oil in the cure of rachitic manifestations in certain species, data obtained over a considerable period of time in an investigation of the nature of the constituent of cholesterol which may be activated antirachitically are reported. These data, in the opinion of the author, constitute convincing evidence that the provitamin constituent of cholesterol is a substance different from ergosterol. The materials tested included irradiated crude cholesterol, irradiated pure cholesterol, fractions from repeated irradiation of pure cholesterol, and irradiated mixtures of cholesterol and ergosterol. In all cases the material was first tested on rats and then on chicks. Only the data on chicks are reported in detail.

Irradiated cholesterol proved more efficacious in preventing rachitic symptoms in chicks than an equivalent number of units of irradiated ergosterol and as effective as the vitamin D of cod-liver oil.

The author discusses the significance of these findings in interpreting many previously reported results and in suggesting further investigations.

The effects of moderate doses of viosterol and of parathyroid extract upon rats. A. F. MORGAN, L. KIMMEL, R. THOMAS, and Z. SAMISCH (*Jour. Biol. Chem.*, 106 (1934), No. 2, pp. 531-544, fig. 1).—This paper reports a detailed study of the bones, soft tissues, and blood serum of young rats kept for about 6 weeks from weaning on a normal diet with varying and moderately excessive doses of viosterol and parathyroid extract fed together and separately. Calcium and phosphorus balances, determined at frequent intervals during the experimental period, are also reported.

The retention of calcium, and to a lesser extent of phosphorus, was usually higher in the rats receiving viosterol (10 D) than in the controls on the same diet without viosterol. The parathyroid extract on the contrary increased the output of calcium and phosphorus, particularly in the group receiving viosterol as well.

Serum calcium and phosphorus were increased by parathyroid extract, and to a greater extent in the animals receiving viosterol as well, the increase being proportional to the amount of extract used. As great an effect was produced by viosterol 10 D plus 60 units of parathyroid extract as by viosterol 1,000 D and 1,500 D alone. Both viosterol and parathyroid extract in increasing doses caused a progressive increase in the ash, calcium, and phosphorus content of the kidneys. On viosterol alone abnormal amounts of calcium and phosphorus were found in the kidneys, beginning with a dosage of 1,000 D. A dosage of 4,000 D for 1 week caused death, with a very high ash content of the kidney. Similar results were obtained with viosterol 10 D and from 80 to 100 units of parathyroid extract. It is suggested that death from overdosage of either the extract or viosterol may have been due to renal failure from calcification. "Attention might well be paid to this possibility in the clinical use of both parathyroid extract and viosterol." The bones showed progressive loss of ash with increasing amounts of viosterol, 500 D to 2,000 D, but practically no loss with parathyroid treatment.

"Thus viosterol and parathyroid extract have similar and additive effects upon serum, kidneys, and bones of animals fed the normal diet, but the calcification of kidneys is more marked in the parathyroid-treated and decalcification of bones more advanced in the viosterol-treated animals of similar serum composition."

An improved vitamin E deficient diet for female rats. P. SCHOORL (*Arch. Néerland. Physiol. Homme et Anim.*, 19 (1934), No. 3, pp. 403-407,

figs. 5).—Complete sterility in female rats at the first insemination in the first generation was secured on a diet consisting of potato starch 100, technical casein 60, technical dextrin 130, McCollum salt mixture 15, brewer's yeast 20, cod-liver oil 2, and butterfat 13 parts. In the author's opinion, this diet is more satisfactory as a basal diet for vitamin E studies than the standard diet of Evans and Burr (*E. S. R.*, 58, p. 595). Vaginal smear tests for sterility have been considered unnecessary, and are replaced by weighing the animals twice weekly, a loss of weight indicating resorption. Whether or not this ration produces sterility in male rats has not been determined fully, although there is indication that the male rats become sterile after a longer period.

The sparing action of fat on vitamin G, H. M. EVANS, S. LEPKOVSKY, and E. A. MURPHY (*Jour. Biol. Chem.*, 107 (1934), No. 2, pp. 443-447, *figs. 6*).—Data are summarized from a large number of rat feeding tests in which the percentages of both dietary fat and vitamin G were varied in an effort to confirm previous evidence that fat does not exert the same sparing action for vitamin G as for vitamin B (*E. S. R.*, 62, p. 293).

"Variations occur in the growth obtained with and without fat when vitamin G is low or absent, but the results viewed broadly do not permit us to state that fat exerts a beneficial effect on diets in which vitamin G is low or absent when the requirements for other known dietary factors are satisfied." It is noted, moreover, that in the absence of vitamin G fat often aggravates the symptoms of vitamin G deficiency.

Nutrition in relation to disease (*Nature [London]*, 134 (1934), No. 3389, pp. 557, 558).—This brief report of a symposium on nutrition in relation to disease, held at a joint meeting of the sections on physiology and agriculture of the British Association for the Advancement of Science at its 1934 meeting in Aberdeen, Scotland, closes with the following statement:

"If indeed, disease due to faulty dietary should eventually prove to be as prevalent as these isolated and limited observations suggest, then there are obvious economic and political implications, especially at the present time, when we are moving toward a planned economic system under which the amount of certain foodstuffs coming on the market and the price at which they may be retailed may be fixed for purely economic reasons. As a matter of fact, we have not sufficient data to warrant making an authoritative statement on the subject. . . . The urgent need of the present time is large-scale investigations over a number of years in different sections of the community in order to obtain data which may be applicable to the populace as a whole."

Nutrition in relation to dental disease, H. E. HARVEY (*U. S. Naval Med. Bul.*, 32 (1934), No. 3, pp. 318-322).—In this review emphasis is placed upon dental caries as an index of general malnutrition or a metabolic disturbance. "It so happens that dental caries may be the only visible evidence of nutritional imbalance, and it is only reasonable to suppose that other body tissues are also affected and hence less resistant to disease. The picture presented by the dental condition thus portrays to the critical observer the fundamental as to whether the body has been or is receiving a balanced nutrition without which abundant health and vigor do not exist."

[Disorders of metabolism] (*Bul. N. Y. Acad. Med.*, 2. ser., 10 (1934), Nos. 1, pp. 16-36, *figs. 7*; 2, pp. 52-94; 3, pp. 103-150, *figs. 3*; 5, pp. 269-319, *figs. 5*; 6, pp. 335-368, 369-376, *fig. 1*; 7, pp. 389-444, *figs. 4*; 8 pp. 457-495, *figs. 7*; 9, pp. 539-573, *figs. 6*; 11, pp. 643-655).—The lectures given at the Sixth annual Graduate Fortnight of the New York Academy of Medicine, October 23 to November 3, 1933, on the general subject Disorders of Metabolism, are as follows:

The Metabolism of Fever, with Special Reference to Diabetic Hyperpyrexia, by H. E. Himwich (pp. 16-36); Metabolism in Hyperthyroidism and Hypothyroidism, by W. W. Palmer (pp. 52-64); Surgical Treatment of Hyperthyroidism, by F. H. Lahey (pp. 65-81); Mineral Metabolism, by J. C. Aub (pp. 82-94); Acidosis and Alkalosis, by D. D. Van Slyke (pp. 103-137); Dehydration and Medical Shock, by D. W. Atchley (pp. 138-150); Fluid Distribution and Edema, by A. A. Weech (pp. 269-288); Congenital Anomalies of Metabolism with Special Reference to Cystinuria and Myopathies, by E. Brand (pp. 289-305); Gout, by L. Lichtwitz (pp. 306-319); Dietary Trends, by R. T. Woodyatt (pp. 335-346); Diabetes in Children, by P. White (pp. 347-357); Considerations Bearing on the Successful Treatment of Diabetes Mellitus, by J. R. Scott (pp. 358-362); Treatment of Diabetic Coma, by H. O. Mosenthal (pp. 363-368); The Treatment of Diabetes with Diets Normal in Carbohydrate and Low in Fat, by H. R. Geyelin (pp. 369-376); Clinical and Biologic Considerations of Obesity and Certain Allied Conditions, by A. A. Epstein (pp. 389-414); A Critical Estimate of the Value of Laboratory Procedures in Disorders of Metabolism, by J. P. Peters (pp. 415-444); General Review of Our Present Knowledge of the Vitamins, by H. C. Sherman (pp. 457-470); The Effects of Moderate Deficiency of Vitamins, by S. W. Clausen (pp. 471-482); Non-Diabetic Ketosis in Children, by O. M. Schloss (pp. 483-495); Hyperparathyroidism and Its Relationship to Diseases of Bone, by H. L. Jaffe (pp. 539-552); Metabolic Disturbances in Relation to the Teeth, by C. F. Bödecker (pp. 553-573); and The Applied Physiology of the Gastro-Intestinal Innervation, by A. C. Ivy (pp. 643-655).

Food allergy in its relation to gastro-intestinal disorders, J. FRIEDENWALD and S. MORRISON (*Amer. Jour. Digest. Diseases and Nutr.*, 1 (1934), No. 2, pp. 100-103).—A brief summary of types of food allergy is followed by a discussion of the symptomatology, diagnosis, and treatment of the gastro-intestinal type, with illustrations from 20 proven cases selected from the authors' practice. Eight condensed case reports are included, representing as many different manifestations of gastro-intestinal allergy. It is noted that food allergy may be not only the direct cause of many abdominal symptoms but also the indirect or precipitating cause of definite digestive diseases.

The anaemias and their treatment, L. J. WITTS (*Lancet [London]*, 1934, II, No. 17, pp. 919-921).—In this paper, which opened a discussion on this subject at a meeting of the Medical Society of London on October 22, 1934, the author emphasizes three general principles, which, in his opinion, form the basis of present knowledge of anemias and their treatment. These are (1) the conception of anemia as due to disturbance in the maturation of the red blood cells, (2) the conception that such a disturbance may be produced by a defective supply of hematinic factors to the bone marrow, and (3) the conception of conditioned deficiencies. Examples are given of factors inhibiting the maturation of erythrocytes through preventing the utilization of raw materials, including infection, metastases, and ingestion of radium salts.

Factors inhibiting the maturation of leucocytes are also discussed on account of the increasing frequency of agranulocytosis and the discovery of the favorable effect of nucleotides in checking the loss of leucocytes, which is the principal feature of the disease. In conclusion the author makes the following comments:

"Liver and nucleotide, which are so essential to the normal development of the blood cells, appear to be harmless in excess and cannot be used to produce erythremia and leukemia. It is apparent, however, that we are steadily gaining knowledge of the factors which control the growth of tissues, and the advances

in hematology can be paralleled by the contemporaneous discovery of simple chemical substances among the vitamins and the endocrines which powerfully influence the growth and development of tissues. There are few places in which the relation between nutrient factors and orderly tissue development can be seen so clearly as in the hemopoietic system, and the general principles which have been established there may prove to have a wider application."

An anemia caused by deaminized casein, A. G. HOGAN and W. S. RITCHIE (*Jour. Biol. Chem.*, 107 (1934), No. 1, pp. 179-189, figs. 3).—In this contribution from the Missouri Experiment Station, evidence is presented that deaminized casein fed to rats as the sole source of protein causes not only a decline in weight with early death, but a type of anemia which cannot be prevented by supplementing the deaminized casein with gelatin or gliadin but is completely prevented by combining it with untreated casein. A small percentage of the animals also developed a severe arthritis. Of two hypotheses suggested in explanation of the anemia (1) that deaminized casein contains something which causes anemia and (2) that it lacks something which is normally required to prevent anemia, the first has been adopted tentatively as the more plausible from the known facts.

The diagnosis and treatment of the iron-deficiency anemias, F. H. BETHELL, S. M. GOLDHAMER, R. ISAACS, and C. C. STURGIS (*Jour. Amer. Med. Assoc.*, 103 (1934), No. 11, pp. 797-802, figs. 6).—This paper deals with the contributing causes, symptoms, diagnostic features, and treatment of hypochromic (iron deficiency) anemia. This type of anemia is shown to result from lack of sufficient available iron for hemoglobin formation. "Such a lack may be induced by (1) depletion of the iron reserves from continued blood loss, (2) inadequate intake of food iron, and (3) improper absorption of the element from the alimentary tract and, as a rare possibility, (4) from inability to utilize available iron."

Tabulated results are given, showing the effects of treatment with simple iron preparations (ferrum reductum, 1.5 g daily, or ferric ammonium citrate, 4 g daily) of 42 cases of iron-deficiency anemia, including 28 with achlorhydria.

The presence or absence of appreciable amounts of copper in the diet had no effect on the response to iron medication, suggesting that in the treatment of the usual type of iron-deficiency anemia no advantage is gained by including copper in therapeutic preparations of iron.

The relation of gastrectomy to anemia, A. C. IVY, O. RICHTER, A. F. MEYER, and H. GREENGARD (*Amer. Jour. Digest. Diseases and Nutr.*, 1 (1934), No. 2, pp. 116-119).—Observations that dogs which have undergone gastrectomy do not develop pernicious anemia led to the trial of desiccated canine stomach, liver extracts, and whole liver in the treatment of pernicious anemia.

The desiccated canine stomach preparation proved to be less than one-half as effective as desiccated whole stomach of swine (ventriculin), canine liver extracts for parenteral administration less than one-fourth as potent as hog, bovine, or equine liver extracts, and canine liver administered orally only about one-half as potent as bovine liver. In discussing the significance of these observations, it is pointed out that "(1) either the 'intrinsic factor' of Castle is present in the intestine, or the potent antipernicious anemia substance is manufactured in the intestine as well as the stomach, or (2) the dog, rat, and pig are so biologically constituted that they do not develop the blood picture of pernicious anemia, or (3) other factors than a deficiency of the 'intrinsic factor' of Castle are concerned in the etiology of pernicious anemia."

Liver therapy for pernicious anemia, W. P. MURPHY (*Science*, 80 (1934), No. 2080, Sup., p. 8).—In this brief comment upon the work of G. R. Minot and

the author, attention is called to the average cost of the treatment of pernicious anemia in various ways. The average amount of liver required by mouth is estimated to be about 11 lb. per month at an approximate cost of \$5.50. The corresponding dosage of a potent liver extract by mouth is three doses daily at an approximate monthly cost of \$17. In comparison with these methods of treatment the development of an effective liver extract for intramuscular injection has made it possible to use only one injection a month and at a cost of only \$1.20. In the author's opinion, the already decreased death rate from pernicious anemia will be further reduced and there need be no deaths from this disease "if each patient will continue to take regularly in some form an adequate amount of liver substance as prescribed by his physician. The amount of liver substance necessary must be determined on the basis of regular determinations of the number of red blood cells and the patient's physical condition."

Lower fat diet in diabetes, J. H. BARACH (*Amer. Jour. Digest. Diseases and Nutr.*, 1 (1934), No. 2, pp. 124, 125).—This is a discussion from the author's experience of the advantages of low-fat higher-carbohydrate over high-fat lower-carbohydrate diets in the treatment of diabetes. The advantages noted include freedom from ketosis, increased glucose tolerance, decreased insulin dosage, lower cholesterol, and less trouble from various complications.

TEXTILES AND CLOTHING

Industrial fabrics, G. B. HAVEN (*New York: Wellington Sears Co., 1934*, pp. X+538, figs. [161]).—Designed as a handbook for engineers, purchasing agents, and salesmen, and dealing especially with cotton fabrics, this volume discusses in successive chapters characteristics of cotton fiber, manufacturing processes, cotton yarn, uses of industrial fabrics, organization and properties of industrial fabrics, laboratory design and practice, and specifications and test methods.

An analysis of some white cotton fabrics, M. E. GRIFFITH and E. M. TUCKER (*Ohio Sta. Bimo. Bul.* 172 (1935), pp. 22-25).—The fabrics analyzed included a sample of relatively high-priced and one of low-priced material of each of three different types—Oxford cloth of fancy basket weave construction, piqué of rib fabric weave, and crossbar dimity of fancy basket weave. In addition, two pieces of striped dimity of the same price were included. There was very little difference in the actual breaking and bursting strength of the same type of fabric of the different price levels, although the strength-weight factor representing the relationship of the warp and filling breaking strength to the weight of the fabric was slightly higher for the higher priced than for the lower priced fabrics. Both the higher priced Oxford cloth and piqué were more nearly uniform in strength than the corresponding lower priced samples.

There was no apparent relation between the strength, weight, and thread count of the fabrics. The average warp strength was greater than the average filling strength. The piqués had the highest thread count and showed a better balance of yarn count and diameter for warp and filling yarns than the other two materials. The piqués also had the highest breaking and bursting strength, followed by the Oxford cloth, and then by the dimities.

"As judged by the uniformity of the fabrics in strength, the balance of yarns, and the amount of finishing materials used, price would seem to be only slight indication of the quality of these fabrics."

The deterioration of weighted silk under the conditions of acidity, alkalinity, and salinity to which fabrics are subjected in service and maintenance, R. EDGAR (*Iowa Sta. Rpt.* 1934, p. 151).—Progress results are reported.

HOME MANAGEMENT AND EQUIPMENT

[Household equipment studies at the Iowa Station] (*Iowa Sta. Rpt. 1934*, pp. 149-151, fig. 1).—Progress reports are given by L. J. PEET and L. E. SATER on the sterilization of tomato, grape, and apple juices and the cooking of fruits and vegetables by the passage of an electric current through the materials in the apparatus described previously (E. S. R., 67, p. 493) and on the application of heat to cooking utensils of different materials, and by PEET on the care of meat in the household refrigerator.

MISCELLANEOUS

Forty-sixth Annual Report [of Arkansas Station], 1934, D. T. GRAY ET AL. (*Arkansas Sta. Bul. 312 (1934)*, pp. 63).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

The Forty-seventh Annual Report of the Colorado Agricultural Experiment Station, [1934], E. P. SANDSTEN (*Colorado Sta. Rpt. 1934*, pp. 28).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fourteenth Annual Report [of Georgia Coastal Plain Station, 1933-34], S. H. STARR (*Georgia Coastal Plain Sta. Bul. 24 (1934)*, pp. 115, figs. 12).—The experimental work not previously referred to, covering the 18-mo. period ended June 30, 1934, is for the most part noted elsewhere in this issue.

Report on agricultural research [of the Iowa Station] for the year ending June 30, 1934, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt. 1934*, pp. 192, figs. 22).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report of the Kentucky Agricultural Experiment Station for the year 1932, II (*Kentucky Sta. Rpt. 1932*, pt. 2, pp. [2]+502, figs. 68).—This contains reprints of Bulletins 326-336, all of which have been previously noted.

A forward look: The Fortieth Annual Report of the Montana Agricultural Experiment Station, [1933], F. B. LINFIELD (*Montana Sta. Rpt. 1933*, pp. 50, fig. 1).—In this report the current agricultural situation is discussed, and the opportunities and responsibilities of the station are outlined. A meteorological report for 1933 is included (pp. 46-49).

Forty-seventh Annual Report of [Nebraska Station, 1933], [W. W. BURR] (*Nebraska Sta. Rpt. [1933]*, pp. 43).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-seventh Annual Report [of Cornell Station], 1934, C. E. LADD ET AL. ([*New York*] *Cornell Sta. Rpt. 1934*, pp. 149).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-seventh Annual Report [of Pennsylvania Station], 1934, [R. L. WATTS ET AL.] (*Pennsylvania Sta. Bul. 308 (1934)*, pp. 38, figs. 5).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

Forty-seventh Annual Report of the South Carolina Experiment Station, [1934], H. W. BARRE, G. H. AULL, ET AL. (*South Carolina Sta. Rpt. 1934*, pp. 149, figs. 28).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Agricultural investigations at the Belle Fourche (S. Dak.) Field Station, 1926-32, B. AUNE, L. A. HURST, and A. OSENBRUG (*U. S. Dept. Agr., Tech. Bul. 454 (1934)*, pp. 53, figs. 12).—The experimental work reported as carried on at this farm, located near Newell, S. Dak., is for the most part noted elsewhere in this issue. Meteorological observations are also included.

NOTES

Kansas College and Station.—The State appropriations for the ensuing biennium aggregate \$1,948,500, which is \$6,200 less than for the biennium ending June 30, 1935. Reductions were made of \$25,000 for maintenance and \$200 for salaries, with increases of \$10,000 for veterinary research, \$7,000 for the outlying experiment fields, and \$2,000 for the substations.

A State law recently enacted makes compulsory R. O. T. C. military training for all male students in the freshman and sophomore years.

F. W. Atkeson, head of the department of dairy husbandry in the Idaho University and Station, has been appointed head of the department of dairy husbandry effective April 1.

Kentucky Station.—Dr. Herbert J. Metzger has been appointed assistant pathologist beginning March 1.

Louisiana University.—The seventy-fifth anniversary of the founding of the institution was observed from April 4 to 13. Opening its doors on a site near Alexandria on January 2, 1860, as the Louisiana State Seminary of Learning and Military Academy under the superintendency of Gen. William Tecumseh Sherman, the institution was transferred in 1869 to Baton Rouge and acquired its present title in 1870 and was merged with the A. and M. College in 1877. Its growth in material equipment, enrollment, and influence has been very striking during the present century and particularly since 1930. Elaborate ceremonies characterized the Diamond Jubilee, including many conferences. April 13 was observed as Agricultural Day, with the principal address by Mr. Edward O'Neal, president of the American Farm Bureau Federation.

Michigan Station.—James A. Neilson, research assistant in horticulture, died February 11 at the age of 54 yr. He was born in Canada and attended the Ontario Agricultural College and the Iowa State College. After a number of years of teaching and extension work in Canada, he came to Michigan in 1929 as specialist in nut culture. He had been president of the Nut Growers' Association, and is credited as largely responsible for the development of paraffin treatment for rose plants and other nursery studies.

North Dakota College and Station.—Harry E. Ratcliffe, assistant professor of agricultural economics and assistant farm economist in the station, has been given leave of absence to accept an appointment in the Division of Cooperation, U. S. Farm Credit Administration. Norval O. Nerdahl has been appointed a special assistant in agricultural economics in the station in connection with the recently initiated regional project in agricultural planning. J. A. Munro, associate professor of economic entomology and entomologist, has been granted leave of absence in order to spend the summer on grasshopper control work in the State for the U. S. Department of Agriculture.

Oregon College and Station.—James Dryden, widely known for his success as a practical poultry breeder, died in Modesto, Calif., on February 5 following an automobile accident at the age of 71 yr. A native of Ontario, he was among the earliest employees of the Utah College and Station, at first mainly in a clerical capacity and later in poultry management. His service in Oregon

covered the period from 1907 to 1930. He established the department of poultry husbandry and carried on extensive breeding studies from the point of view of practical egg production. He is credited with having developed the first hen to lay 300 eggs in a year under official supervision, as well as the first to lay 1,000 eggs in a lifetime. He did much to stimulate the poultry industry on the Pacific coast, and *The Rural New Yorker* quotes *Hatchery Tribune* as follows: "Dryden hens have won egg-laying contests throughout the country, and Dryden strains are now spread over the map of the civilized world."

Washington College and Station.—To accommodate the regional erosion nursery for the Pacific Northwest and other forage and field crops work of the U. S. Department of Agriculture and the station, 160 acres of additional land have been purchased from an estate adjoining the college and station farm.

Rex E. Willard, head of the department of farm management and agricultural economics but on leave since May 15, 1934, as regional director of the land policy section of the Agricultural Adjustment Administration for the Pacific Northwest, has resigned to remain in Federal work.

West Virginia University and Station.—A record attendance for recent years of 883 men and women marked the Twenty-seventh Annual Farm and Home Week. Five State farm organizations held their annual meetings in connection with this event.

Dr. C. R. Orton, head of the department of biology and chairman of the station's land use committee, has been designated a member of the State Planning Board.

Dr. Thomas Clark Atkeson, associated with the university and station for many years, died March 26, at Columbia, Ala. He was born in West Virginia February 15, 1852, and educated in the West Virginia and Kentucky Universities. From 1891 to 1893 he was professor of agriculture in the university, from 1897 to 1911 dean of the College of Agriculture and professor of agriculture, and from 1911 to 1914 professor of animal husbandry. He also served as president of Morris Harvey College from 1893 to 1897. He was prominent in the Grange for many years and legislative representative of the National Grange in Washington, D. C., from 1918 to 1927. He was also a prolific writer of books and articles on agriculture and country life, including a *Semicentennial History of the Patrons of Husbandry* (1916).

Association of Land-Grant Colleges and Universities.—The forty-ninth convention of this association will be held in Washington, D. C., from November 18 to 20, 1935. Following the general schedule of former years the convention will open Monday morning, and its public sessions will close Wednesday noon.

Agricultural Section in International Congress for Scientific Management.—A note in *Scottish Journal of Agriculture* states that in view of the increasing attention which is being given to the principles of management in agriculture, the Sixth International Congress for Scientific Management is to include a special section on this subject. The Congress is to be held in London from July 15 to 20.

Second International Congress of Rural Engineering.—This Congress will be held in Madrid under the patronage of the Spanish Government from September 26 to October 3, 1935. It will be organized into four sections as follows: (1) Soil science, agricultural hydraulics, rural estate management, (2) rural construction, (3) agricultural machinery, uses of electricity in agriculture, and (4) scientific management of agricultural work. The organization committee includes Miguel Echegaray, now agricultural attaché of the Spanish Embassy, Washington, D. C.

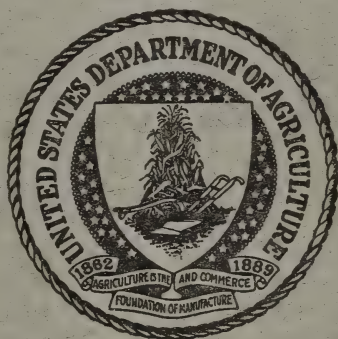
○

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

VOLUME 72

INDEX NUMBER

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 15 cents
Subscription per volume (2 volumes a year) consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.50

INDEX OF NAMES

- Aamodt, O. S., 180, 576, 599, 615.
- Abbott, O. D., 413.
- Abderhalden, E., 576.
- Abe, T., 198, 199, 201, 202.
- Abel, F. A. E., 11.
- Abell, M. S., 486.
- Abercromby, R., 158.
- Ackerman, R. A., 523.
- Ackerman, W. T., 546.
- Ackerson, C. W., 94.
- Ackert, J. E., 688.
- Adair, C. R., 756, 765.
- Adair, G. S., 443.
- Adair, M. E., 443.
- Adams, J. E., 455, 744.
- Adams, R. L., 401, 402, 405.
- Adams, W. L., 89, 456.
- Adams, W. R., 56.
- Adamson, R. S., 458.
- Addington, L. H., 832.
- Adler, S., 387.
- Adolf, M. S., 581.
- Adriano, F. T., 868.
- Aff, H. M., 464.
- Affleck, C., 160, 539.
- Afzal, M., 177.
- Afzal Husain, M., 227.
- Agduhr, E., 424, 565.
- Ahlborn, M., 865.
- Ahlgren, H. L., 466, 501, 502.
- Ahmad, N., 139.
- Ahmann, C. F., 413.
- Aikman, J. M., 757.
- Aitken, T. R., 867.
- Akai, S., 197.
- Akhtar, A. R., 168.
- Albert, A. R., 448.
- Albert, D. W., 627.
- Albert, W. B., 744, 758.
- Albrecht, H. R., 488, 492.
- Albrecht, W. A., 299, 448.
- Alcaraz, F. A., 677.
- Alcasid, E., 677.
- Alder, B., 371, 382.
- Aldous, A. E., 175.
- Aldrich, R. E., 370.
- Aldrich, W. W., 480, 621, 775.
- Alexander, L. J., 208.
- Alexander, L. M., 131.
- Alexander, R. A., 529.
- Alexopoulos, C. J., 29.
- Alfonsus, E. C., 502.
- Ali, M., 217.
- Alicata, J. E., 214, 251, 688.
- Allan, W., 320.
- Allen, A. A., 652.
- Allen, E. A., 214.
- Allen, H., 36, 96, 523.
- Allen, H. R., 25.
- Allen, H. W., 358.
- Allen, J. A., 257.
- Allen, L. A., 835.
- Allen, R. C., 782.
- Allen, R. F., 629, 633, 796.
- Allen, T. C., 502.
- Allen, T. W., 112, 262.
- Alley, H. R., 101, 247, 525.
- Allin, B. W., 118, 711.
- Allison, F. E., 20, 21.
- Allison, R. v., 144, 298, 327, 347, 393.
- Allison, W. W., 706.
- Allott, E. N., 12.
- Allred, C. E., 407.
- Allyn, R. S., 182.
- Almaden, P., 885.
- Almeida, J. L. de, 697.
- Almquist, H. J., 172, 521, 829.
- Alt, E., 446.
- Altman, M., 524.
- Altmann, M., 830.
- Alway, F. J., 747.
- Alwis, E. de, 666.
- Amburgey, L. V., 517.
- Ames, F., 55.
- Anantanarayanan, K. P., 655.
- Andersen, K. T., 216.
- Anderson, A. P., 112, 262.
- Anderson, A. W., 515.
- Anderson, C., 691.
- Anderson, D. A., 23, 164.
- Anderson, D. B., 749.
- Anderson, E. G., 168.
- Anderson, E. O., 256, 525.
- Anderson, H. W., 778.
- Anderson, I. V., 344.
- Anderson, J., 819.
- Anderson, M. S., 161.
- Anderson, N. P., 424.
- Anderson, P. J., 324.
- Anderson, R. J., 441.
- Anderson, W. A., 128.
- Andersson, G., 470.
- Andersson, Y., 831.
- Andes, J. O., 78, 345, 346, 802.
- Andre, F., 224.
- André, M., 670.
- Andrewartha, H. G., 811.
- Andrewes, H. E., 367.
- Andrews, F. S., 769.
- Andrews, G. D., 546.
- Andrews, J., 688.
- Andrews, J. S., 214.
- Andrews, W. B., 747.
- Angell, H. R., 199, 642.
- Ångström, A., 576, 588.
- Anioay, D., 54.
- Anres, M., 645.
- Ansbacher, S., 525.
- Anson, R. R., 320.
- Anthony, E. L., 243.
- Anthony, R. D., 477.
- Appanna, M., 359.
- Appel, O., 353.
- Appleby, V., 564.
- Appleman, D., 627.
- Arber, A., 467.
- Arceneaux, G., 179.
- Archbold, H. K., 620.
- Archibald, E. S., 708.
- Archibald, R. C., 584.
- Aref, H., 6.
- Ariyama, H., 420.
- Ark, P. A., 68.
- Armstrong, A. R., 724.
- Armstrong, G. M., 758, 789.
- Armstrong, H., 160.
- Armstrong, J. M., 311, 404.
- Armstrong, W. D., 779.
- Arnaud, G., 644.
- Arndt, C. H., 789.
- Arno, A. A., 598.
- Arnold, P. T. D., 523.
- Arriëns, A. L. L., 789.
- Arthur, I. W., 854.
- Arthur, J. C., 57.
- Asbury, C. E., 626.
- Asbury, S. E., 592.
- Asdell, S. A., 106, 756, 823.
- Ashbrook, F. G., 87, 375.
- Ashby, R. C., 858.
- Ashby, W., 428.
- Ashcroft, J. M., 649.

- Ashworth, U. S., 515, 525, 823.
 Aston, B. C., 96.
 Atanasoff, D., 790.
 Atchley, D. W., 891.
 Atkeson, F. W., 97, 117, 895.
 Atkeson, T. C., 896.
 Atkinson, A., 144.
 Atkinson, R. G., 703.
 Atwater, W. O., 433.
 Aub, J. C., 891.
 Aubert, P., 623.
 Aubertin, D., 815.
 Auchter, E. C., 187, 483, 616, 779.
 Aufjeszky, L., 576.
 Aull, G. H., 270, 855, 894.
 Aune, B., 759, 770, 826, 827, 831, 894.
 Austin, M. D., 502, 505.
 Austin, P. R., 604, 605.
 Austin, S., 167.
 Auten, J. T., 194.
 Auten, M., 663.
 Avery, G. S., Jr., 593, 613.
 Avery, P., 461.
 Awbery, J. H., 130.
 Awibowo, R., 817.
 Axelsson, J., 288, 604.
 Aylesworth, P. F., 269.
 Ayres, S., Jr., 424.
 Ayyangar, G. N. R., 178.
 Ayyar, C. S. R., 455.
 Ayyar, N. K., 826.
 Ayyar, T. V. R., 359, 655.
 Babbitt, H. E., 400.
 Babcock, C. J., 246, 524.
 Baber, E., 218.
 Bachtell, M. A., 36.
 Bacon, C. W., 613.
 Bacon, G. P., 575.
 Badgett, W. H., 846, 847.
 Baerg, W. J., 806.
 Baert, H., 418.
 Bagenal, N. B., 332.
 Bahrt, G. M., 780.
 Bailey, A., 398.
 Bailey, D. H., 376.
 Bailey, E. M., 130, 592.
 Bailey, H. L., 662, 665.
 Bailey, I. W., 593.
 Bailey, J. E., 765, 774.
 Bailey, L. H., 326, 868.
 Bailey, R. W., 541.
 Bailey, S. F., 362, 658.
 Bailly, J., 536.
 Bain, H. F., 778.
 Bainer, R., 115, 263.
 Baker, A. Z., 260.
 Baker, F. E., 80, 81, 230.
 Baker, F. S., 193.
 Baker, H. P., 143.
 Baker, K. F., 67, 354.
 Baker, O. E., 3.
 Baker, R. E. D., 52.
 Baker, W. C., 504.
 Baker, W. W., 358.
 Bakke, A. L., 757.
 Bakken, H. H., 526.
 Balachowski, S., 418.
 Balachowsky, A., 363.
 Balakhowsky, A., 665.
 Balch, R. T., 471.
 Baldelli, M., 132.
 Baldwin, H. I., 56, 344, 487.
 Baldwin, I. L., 143, 448.
 Baldwin-Wiseman, W. R., 741.
 Bales, A., 143.
 Bales, E. R., 575.
 Ball, E. D., 362.
 Ballard, W. W., 39, 736.
 Ballinger, R. A., 130, 401, 707, 715.
 Ballou, F. H., 47.
 Balls, A. K., 521.
 Balls, W. L., 320.
 Balozet, L., 699.
 Baltzer, A. C., 523.
 Bancroft, H., 628.
 Bane, W. A., 335.
 Banerjee, B. N., 342.
 Banfield, W. M., 631.
 Bao, D.-L., 873.
 Barach, J. H., 893.
 Barbey, A., 218.
 Barborka, C. J., 576, 865.
 Bare, C. O., 807.
 Barker, H. A., 437.
 Barkworth, H., 100.
 Barmore, M. A., 275.
 Barnes, B. F., 631.
 Barnes, D. F., 73, 365.
 Barnes, H. F., 501, 510, 814.
 Barnes, M. F., 257.
 Barnes, W. C., 770.
 Barnett, A. R., 855.
 Barnett, H. L., 326.
 Barnett, H. M., 296.
 Barnette, R. M., 298, 316.
 Barr, H. T., 115.
 Barraclough, K. E., 268.
 Barre, H. W., 144, 431, 894.
 Barrett, J. T., 632.
 Barritt, J., 441.
 Barss, H. P., 432.
 Barter, A. M., 620.
 Barthelet, J., 499.
 Bartholomew, R. P., 165, 743, 768.
 Bartlett, J. M., 372, 414, 592.
 Bartlett, J. W., 95, 98.
 Bartlett, K. A., 508.
 Bartlett, S., 526, 833.
 Barton, G. T., 547.
 Barton-Wright, E., 205.
 Basinger, A. J., 225.
 Basore, C. A., 852.
 Basu, N. K., 728, 729.
 Batchelder, E. L., 242, 243.
 Batjer, L. P., 618, 773.
 Batson, F. S., 343, 782.
 Batten, H. M., 651.
 Bauch, R., 790.
 Baudet, E. A. R. F., 217.
 Bauer, F. C., 24.
 Baumann, C., 418.
 Baumann, C. A., 380, 442, 460.
 Baur, A. J., 302.
 Baur, L., 438, 440.
 Bausman, R. O., 551, 854.
 Bayer, L. D., 448, 450.
 Bayfield, E. G., 474.
 Bayne-Jones, S., 381.
 Bayo, J. P.-S., 720.
 Beach, B. A., 532, 837.
 Beach, G., 190.
 Beach, J. R., 259.
 Beach, W. S., 789.
 Beakbane, A. B., 341.
 Beal, J. A., 511.
 Beal, J. M., 462.
 Beale, H. P., 629.
 Beall, H. W., 297.
 Bean, L. H., 118, 123.
 Beard, F. H., 329.
 Beard, F. J., 822, 854.
 Beard, P. J., 583.
 Beath, O. A., 251, 381.
 Beattie, J. H., 331, 612.
 Beattie, R. K., 70, 346.
 Beaudette, F. R., 109, 390.
 Beaumont, A. B., 761.
 Beaumont, J. H., 186.
 Beavens, E. A., 6.
 Bebbington, A. G., 320.
 Bechdel, S. I., 831.
 Bechhold, H., 640.
 Becker, C. L., 601.
 Becker, E. R., 103, 530, 664, 688.
 Becker, R. B., 370, 375, 376, 523.
 Beckwith, C. S., 47, 74, 75.
 Becraft, R. J., 316, 541.
 Bedford, G. A. H., 529, 530.
 Bedford, H. W., 320.
 Beeson, C. F. C., 658, 813.
 Beeson, W. M., 380.
 Behrndt, S., 628.
 Beijerinck, W., 297.
 Bek, J. J. M., 500.
 Belling, I. von S., 232.
 Bell, F. G., 757.
 Bell, F. N., 532.
 Bell, M. E., 561, 565.
 Bell, R. W., 95.
 Bell, W. B., 356.
 Bellair, G., 637.
 Bellair, T. S., 526.
 Bellerby, C. W., 172.
 Bellosillo, G. C., 820.
 Bemis, A. F., 428.
 Bender, C. B., 95.

- Bender, H. B., 29.
 Bender, R. C., 378.
 Bendixen, H. A., 241, 242, 243, 524.
 Benedict, C. G., 279.
 Benedict, F. C., 279.
 Benedict, M. R., 853.
 Bengis, R. O., 441.
 Bengtsson, S., 676.
 Benjamin, L. V., 476.
 Bennet-Clark, T. A., 444.
 Bennett, C. C., 758.
 Bennett, C. G., 243.
 Bennett, H. H., 111, 737.
 Bennett, M. K., 854.
 Bennett, R. E., 743.
 Bennett, S. C. J., 386.
 Benson, C. A., 488.
 Benson, R. E., 194.
 Bentley, F. L., 823.
 Bentley, J. R., 177.
 Bentley, R. C., 119.
 Beran, F., 217, 638.
 Beran, O., 217.
 Bercaw, L. O., 403, 551.
 Berdnikov, V. A., 691.
 Beresford, H., 117.
 Beresford, R., 854.
 Berg, A., 629.
 Berglund, N., 831.
 Berfland, S. S., 174.
 Berry, J. A., 347, 477, 626.
 Berry, L. J., 388.
 Berry, L. N., 93, 553.
 Berry, W. E., 458.
 Besley, H. E., 117, 700.
 Besse, R. S., 404.
 Bethell, F. H., 892.
 Bethke, R. M., 671, 672.
 Betts, A. D., 513, 819.
 Bevan, W. L., 144.
 Bever, W. M., 62.
 Beveridge, W. I. B., 250.
 Bewley, J. P., 14.
 Beynum, J. van, 686.
 Bezssonoff, N., 283, 422, 585.
 Bieli, J., 260, 391, 537.
 Biester, H. E., 103, 389.
 Biggar, R. J., 107.
 Biguria, F., 722.
 Bills, C. E., 888.
 Bingham, G. H., 268.
 Binkley, A. M., 476.
 Binney, W. S., 653.
 Birkley, 12.
 Birch, T. W., 283.
 Birchard, F. J., 40, 45.
 Bird, E. W., 830.
 Bird, H. R., 515.
 Bird, S., 390, 460, 520.
 Birkeland, B. J., 446.
 Birkeland, J. M., 629.
 Bisbey, B., 564.
 Bischoff, F., 723.
 Bishara, I., 661.
 Bishop, C. P., 257.
 Bishop, H. A., 430.
 Bishopp, F. C., 74, 228, 688.
 Bisland, R. B., 179.
 Bissell, T. L., 512.
 Bissey, R., 475, 476.
 Bizal, R. S., 562.
 Bizzell, J. A., 758.
 Bjälfve, G., 317.
 Bjornson, C., 575.
 Black, A., 823.
 Black, A. G., 854.
 Black, J. D., 853.
 Black, L. M., 241, 788.
 Black, W., 168.
 Black, W. H., 90.
 Blackman, G. E., 475, 607.
 Blackmon, G. H., 54, 326, 327, 485.
 Blackmore, B., 733.
 Blair, A. W., 14, 21, 23, 304, 591.
 Blair, J. B., 389.
 Blake, D., 160.
 Blake, M. A., 47, 209.
 Blakemore, F., 109.
 Blalock, H. W., 863.
 Blanch, G. T., 709.
 Blanchard, E. E., 658.
 Blanchette, W. A., 395.
 Blank, L. M., 489.
 Blanton, F. S., 59, 80.
 Blasingame, R. U., 704, 846.
 Blattny, C., 497, 499.
 Bledsoe, R. P., 315.
 Blecker, W. L., 845.
 Blish, M. J., 867.
 Bliss, D. E., 633.
 Blizzard, W. L., 370.
 Block, L. H., 741.
 Block, R. J., 443.
 Blodgett, E. C., 489.
 Blodgett, F. M., 630, 788.
 Blood, H. L., 25, 195, 347.
 Blount, W. P., 536.
 Blundell, J. E., 855.
 Boals, G. P., 854.
 Boardman, H. S., 144.
 Boas, J. E. V., 217.
 Boatman, J. L., 743.
 Bobone, A., 779.
 Bockmann, H., 793.
 Bödecker, C. F., 891.
 Bodenheimer, F. S., 225, 453.
 Bodman, G. B., 745.
 Børlage, G. D., 114.
 Bogart, R., 465.
 Bogdanoff, V. M., 527.
 Bogert, L. C., 279.
 Bohannan, C. D., 716.
 Bohstedt, G., 370, 378, 515, 523, 526, 559.
 Böker, H., 857.
 Bold, H. C., 31.
 Bond, M. C., 853.
 Bondar, G., 818.
 Bondy, F. F., 807.
 Bongini, V., 70.
 Böning, K., 639.
 Bonnevie, K., 602.
 Bonney, V. B., 133.
 Booth, J. F., 714.
 Booth, R. G., 685.
 Borchers, F., 216.
 Borden, A. D., 77, 360.
 Borisov, P. I., 174.
 Bornstein, H., 544.
 Borodin, D. N., 593, 610.
 Borthwick, H. A., 115, 328, 641.
 Bortner, C. E., 748.
 Bos, A., 698.
 Boss, A., 143.
 Boswell, V. R., 612.
 Bosworth, A. W., 872.
 Botham, G. H., 828.
 Botsford, H. E., 846.
 Botsford, R. C., 228.
 Boucher, R. V., 514.
 Boughton, D. C., 688.
 Bourgin, G. V., 644.
 Bourgin, M. F. V., 489.
 Bourne, A. I., 73, 358.
 Bourne, B. A., 316, 347, 353, 641.
 Bouyoucos, G. J., 449, 747.
 Bowling, J. D., Jr., 613.
 Boyce, E. F., 25, 89, 673.
 Boyd, A. N., 383.
 Boyd, F., 129.
 Boyd, O. C., 346, 630.
 Boyd, R. L., 186, 337.
 Boyd, T. A., 703.
 Boyd, W. L., 387.
 Boyer, A. J., 686.
 Boyer, J. A., 706.
 Boyer, P. B., 407.
 Boyle, E., 7.
 Boysen-Jensen, P., 597.
 Bracken, A. F., 180, 298, 316, 347.
 Brackett, E. E., 851.
 Bradley, C. J., 711.
 Bradley, G. H., 228.
 Bradley, W. G., 819.
 Bradway, E. M., 879.
 Braga, A., 576.
 Brame, W. W., 823.
 Branaman, G. A., 236.
 Branas, J., 802.
 Brand, E., 891.
 Brandenburg, T. O., 255.
 Brandes, E. W., 34.
 Brandly, C. A., 258.
 Branion, H. D., 522.
 Brann, J. W., 489.
 Brannen, C. O., 712, 863.
 Brannon, J. M., 525.
 Brannon, L. W., 358.
 Brase, K. D., 480, 773.
 Bratley, C. O., 630.
 Bratley, H. E., 358.
 Braun, E. W., 118, 410.
 Bray, C. I., 89, 370.

- Bray, R. H., 591.
 Brazie, D., 92.
 Breaux, R. P., 726.
 Breed, R. S., 429, 680.
 Breirem, K., 676.
 Brenchley, G. H., 770.
 Breslavets, L. P., 749.
 Bressler, R. G., 144.
 Brewbaker, H. E., 323.
 Bridges, A., 266, 552.
 Brierley, P., 630.
 Brierley, W. G., 623.
 Briggs, C. H., 359.
 Brigham, G. D., 256.
 Brill, A. K., 886.
 Brink, R. A., 467, 488, 492.
 Britton, W. E., 216, 429.
 Brizi, A., 375, 699.
 Brock, R. L., 248, 525.
 Brockington, S. F., 867.
 Brody, A. L., 807.
 Brody, S., 85, 86, 515, 525, 539, 823.
 Bromley, S. W., 229, 785.
 Bronkhorst, J. J., 823.
 Brooker, M. A., 120.
 Brooks, A., 652.
 Brooks, A. N., 346, 630.
 Brooks, C., 67.
 Brooks, C. F., 589.
 Brooks, E. C., 144.
 Brooks, H. J., 756.
 Brouwer, E., 234.
 Brown, A. M., 5, 631.
 Brown, A. P., 413, 428.
 Brown, B. E., 64, 470.
 Brown, D. E., 43.
 Brown, E., 34.
 Brown, E. M., 466, 514.
 Brown, E. O., 784, 788.
 Brown, E. W., 360.
 Brown, F., 593.
 Brown, F. A., 722.
 Brown, H. B., 763.
 Brown, H. D., 47.
 Brown, H. P., 57.
 Brown, J. G., 346.
 Brown, L. A., 744.
 Brown, M., 448.
 Brown, M. H., 18.
 Brown, M. S., Jr., 563.
 Brown, N. A., 59, 648.
 Brown, P. E., 28, 164, 304, 743, 757.
 Brown, W. C., 524.
 Brown, W. L., 93.
 Brown, W. R., 523.
 Browne, F. L., 543.
 Brownlie, T. A. M., 265.
 Bruce, H. A., 753.
 Bruce, O. C., 13.
 Brueckner, H. J., 99, 524, 830.
 Brumpt, E., 229, 514.
 Brunett, E. L., 807.
 Brunner, E. deS., 853.
 Brunson, A. M., 38, 609.
 Brutzkus, B., 861.
 Bryan, A. A., 757.
 Bryan, C. S., 533.
 Bryson, H. R., 78.
 Bubberman, C., 839, 840.
 Buchanan, J. H., 854, 866.
 Buchanan, R. E., 894.
 Buchholtz, W. F., 492.
 Buchmann, W., 216.
 Buck, J. M., 102, 104.
 Buckhannan, W. H., 14.
 Buckman, S., 345.
 Bueno, J. R. de la T., 807.
 Buhner, E. M., 648.
 Bujanda, E. M. de, 857.
 Bukasov, S. M., 40, 322.
 Bulgakov, S. V., 598.
 Bulkley, G. S., 242.
 Bull, L. B., 105, 840.
 Bullard, J. F., 104.
 Bunting, R. W., 733.
 Bunyea, H., 253.
 Bunzell, H. H., 167.
 Burchard, J., 2nd., 428.
 Burdette, R. C., 228, 575.
 Burge, W. E., 593.
 Burgess, E. D., 819.
 Burk, L. B., 87.
 Burke, O. D., 630, 788.
 Burkholder, W. H., 788.
 Burks, B. D., 358.
 Burmester, B. R., 445.
 Burn, J. H., 566.
 Burnet, F. M., 844, 845.
 Burnett, L. C., 757, 788.
 Burnett, W. L., 358.
 Burnham, C. R., 639.
 Burns, F. W., 370.
 Burns, G. R., 56.
 Burns, K. V., 144.
 Burnside, C. E., 513.
 Burr, W. W., 45, 894.
 Burrell, A. B., 187, 480, 788.
 Burrell, M., 579.
 Burruss, J. A., 143.
 Bushnell, J., 40, 47, 765.
 Bushnell, L. D., 258.
 Bussell, F. P., 758.
 Buston, H. W., 29, 30.
 Butler, O., 475, 476.
 Butler, W., 632.
 Button, F. C., 95.
 Buxton, P. A., 815.
 Byerly, T. C., 87, 680.
 Byers, H. G., 161, 449.
 Cahill, W. M., 567.
 Calcinai, M., 732.
 Caldwell, D. W., 384.
 Caldwell, M. L., 442.
 Caldwell, R. M., 61.
 Call, L. E., 144.
 Callenbach, E. W., 678, 823.
 Callmar, G., 337, 774.
 Calvery, H. O., 829.
 Camargo, F., 845.
 Cameron, C., 178.
 Cameron, G. R., 227.
 Cameron, H. C., 137.
 Cameron, S. H., 627.
 Cameron, W. C., 242.
 Camp, A. F., 327, 781.
 Camp, J. P., 316, 467.
 Campbell, C., 654.
 Campbell, F. L., 503.
 Campbell, J. M., 703.
 Campbell, M. B., 722.
 Campbell, M. H., 838.
 Campbell, R. E., 511.
 Candee, F. W., 243.
 Canfield, R. H., 608.
 Cannon, C. Y., 523, 757, 830.
 Canzanelli, A., 437.
 Card, D. G., 854.
 Card, L. E., 275.
 Cardon, P. V., 429, 853.
 Carlson, E. R., 529.
 Carlson, J. W., 316.
 Carmin, J., 359, 660.
 Carnecross, J. W., 124.
 Carnes, A., 701.
 Carns, W. A., 758.
 Carolus, R. L., 182.
 Carpano, M., 530, 531.
 Carpenter, C. A., 112.
 Carpenter, C. W., 798.
 Carpenter, D. C., 133, 524, 587.
 Carr, E. G., 84.
 Carrick, C. W., 237.
 Carrick, D. B., 773.
 Carroll, J. C., 608.
 Carroll, W. R., 28.
 Carslaw, R. McG., 266, 855.
 Carter, D. G., 846.
 Carter, F. M., 645.
 Carter, R. H., 74, 331.
 Carter, W., 657, 658.
 Carter, W. B., 653.
 Carter, W. H., 544.
 Carter, W. T., 315.
 Cartwright, O. L., 665, 807.
 Carver, J. S., 92, 239.
 Carver, W. A., 316.
 Cary, C. A., 370.
 Case, H. C. M., 853.
 Casida, L. E., 523.
 Cassell, R. C., 489.
 Cassidy, H., 882.
 Castle, W. E., 312, 313.
 Catchpole, H. R., 314.
 Cate, P. H., 836.
 Cathcart, C. S., 89, 592, 617.
 Cathcart, E. P., 579.
 Caum, E. L., 356.
 Cavert, W. L., 713.
 Cavitt, H. S., 80.
 Cazaux, 257.
 Cernaianu, C., 102, 845.
 Chabre, P., 881.
 Chace, E. M., 869.
 Chace, E. P., 144.

- Chadwick, L. C., 47.
 Chaix, P., 883.
 Chaldina, M., 686.
 Chalmers, C. H., 683, 819.
 Chamberlin, F. S., 232.
 Chamberlin, V. D., 241, 521, 828, 829.
 Chamberlin, W. J., 230.
 Chandler, F. B., 625.
 Chandler, N., 631, 640.
 Chandler, R. F., Jr., 185, 186.
 Chandler, W. H., 188, 478.
 Chaney, M. S., 865.
 Chang, C. Y., 824.
 Chang-Wang Tu, 159.
 Chapman, A. B., 523.
 Chapman, A. J., 80.
 Chapman, H. H., 447.
 Chapman, P. W., 143.
 Chaptal, L., 456.
 Chardon, C. E., 460.
 Charles, D. A., 524.
 Charles, T. B., 374, 546.
 Charles, V. K., 631.
 Chase, W. W., 458.
 Chatfield, C., 133.
 Chatterjee, N. C., 359.
 Chatterjee, S. N., 658.
 Chavarrfa, A. P., 283.
 Cheesman, E. E., 170, 755.
 Chelle, 257.
 Chen, H. T., 664.
 Chen, K. P., 578.
 Chen, Y. S., 764.
 Chester, K. S., 432, 800.
 Chetty, C. V. S., 611.
 Chevallier, A., 154, 418, 739, 881.
 Chew, A. P., 123.
 Chibnall, A. C., 5, 581.
 Chien, T. H., 578.
 Child, A. M., 132.
 Childs, L., 814.
 Chippindale, H. G., 45, 607.
 Chittenden, D. W., 86, 515.
 Chitwood, B. G., 214, 840.
 Chmelař, F., 174.
 Chorou, Y., 154, 739.
 Christensen, C., 211.
 Christensen, C. L., 3.
 Christensen, J. J., 491.
 Christenson, L. D., 345, 346.
 Christian, C. S., 607.
 Christie, J. R., 214.
 Christopher, E. P., 335, 618.
 Christophers, R., 814.
 Christophersen, P., 268, 269.
 Christy, D. F., 854.
 Chu, P. E., 304.
 Chuinard, F. G., 880.
 Churchill, B. R., 174.
 Claassen, P. W., 807.
 Clague, J. A., 191.
 Clancy, D. W., 667.
 Clara, F. M., 195.
 Claridge, J. H., 206.
 Clark, E. R., 618, 628.
 Clark, F. H., 312, 463.
 Clark, G. E. M., 632.
 Clark, G. L., 682.
 Clark, H. E., 22.
 Clark, I., 319.
 Clark, J. A., 767.
 Clark, J. H., 47, 340.
 Clark, N., 574.
 Clark, N. A., 517.
 Clark, N. G., 131.
 Clark, S. W., 323.
 Clark, T. A. B., 444.
 Clark, V., 285.
 Clarke, W. E., 144.
 Clarke, C. H. D., 538.
 Clarke, S. E., 181.
 Clausen, S. W., 891.
 Clawson, A. B., 253.
 Clawson, M., 854.
 Claypool, L. L., 329, 334, 777.
 Clayton, B. S., 393.
 Clayton, C. F., 853.
 Clayton, E. E., 65, 630.
 Clayton, F. L., 160.
 Clayton, H. H., 160.
 Cleare, L. D., 662.
 Cleary, J. P., 583.
 Clegg, G. G., 320.
 Clement, S. L., 124.
 Clements, C., 216.
 Clements, H. F., 594.
 Clevenger, L. C., 823.
 Clifton, C. E., 583.
 Cline, I. M., 742.
 Cline, J. A., 560.
 Clinton, G. P., 429, 803.
 Cloke, P., 143, 144.
 Clokey, I. W., 168.
 Clower, J. I., 264.
 Clyburn, T. M., 758, 823.
 Clyde, A. W., 831, 846.
 Clyde, G. D., 393.
 Cobb, G. S., 59.
 Coca, A. F., 424.
 Cochran, F. D., 49.
 Cochran, G. W., 316.
 Cochran, H. L., 770.
 Cochran, L. C., 631.
 Cockerell, T. D. A., 501.
 Cockerill, P. W., 553.
 Coe, F. M., 327, 622.
 Coe, M. R., 7, 832, 867.
 Coffey, W. C., 4, 143.
 Coffman, F. A., 62.
 Coghlan, G. E., 222.
 Cohee, C. M., 25.
 Cohen, R. L., 266, 855, 857.
 Coile, T. S., 56.
 Coke, J., 714.
 Coker, T., 524.
 Colby, A. S., 778.
 Colby, H. L., 479.
 Cole, H. H., 314.
 Cole, H. L., 242.
 Coleman, D. A., 326.
 Coleman, H., 55.
 Coleman, J. M., 467.
 Coleman, L. C., 269.
 Collier, T. R., 700.
 Collings, G. H., 315.
 Collins, D. L., 813.
 Collins, E. V., 757, 806, 846.
 Collins, J. F., 628.
 Collins, W. D., 111.
 Collip, J. B., 313.
 Collison, R. C., 335, 336.
 Colman, W., 73.
 Colvin, C., 275.
 Colvin, E. M., 403.
 Combs, O. B., 184.
 Combs, W. B., 379, 380, 477, 525.
 Comfort, J. E., 514.
 Comin, D., 47.
 Common, R. H., 678.
 Compere, H., 370.
 Compton, C., 481.
 Compton, L. E., 61.
 Condit, I. J., 626, 630.
 Conn, H. J., 591.
 Connaughton, C. A., 487.
 Conner, A. B., 143.
 Conner, S. D., 303.
 Connors, C. H., 47.
 Connor, H. A., 489.
 Conser, C. C., 118.
 Converse, H. T., 523.
 Conway, E. J., 446.
 Cook, H. T., 630.
 Cook, M. T., 490, 630.
 Cook, O. F., 34.
 Cook, W. C., 74.
 Cooley, J. S., 632.
 Cooley, R. A., 529.
 Coombs, A. V., 606.
 Coons, C. M., 721.
 Coons, G. H., 34.
 Cooper, H. P., 315, 744, 758, 769.
 Cooper, J. R., 756, 768.
 Cooper, T. P., 4, 142.
 Cooper, W. C., 192.
 Coover, W. F., 866.
 Cope, J. A., 488.
 Copeland, O. C., 244, 376.
 Copeland, R. E., 542.
 Copeman, P. R. v. d. R., 342.
 Corbet, A. S., 453.
 Corbet, R., 882.
 Corder, H. B., 183.
 Cormack, M. W., 796.
 Cormany, C. E., 323.
 Cornelius, P. S., 241.
 Cornil, L., 881.
 Cornish, R. E., 584.
 Correll, J. T., 520.
 Cory, E. N., 40.
 Cosby, S. W., 14, 34, 46.
 Cosgrove, K. W., 727.
 Cosson, 696.
 Costa, D., 322.

- Costa Lima, A. da, 664.
 Costantin, J., 793, 797.
 Costanzo, G., 862, 863.
 Cotner, F. B., 662.
 Cottam, C., 30.
 Cotter, R. U., 638.
 Cotterell, G. S., 666.
 Cottier, W., 370.
 Cotton, W. E., 102, 104.
 Cottrell-Dormer, W., 798.
 Couch, J. F., 253.
 Coulson, E. J., 878.
 Coulter, H. N., 328.
 Coulter, S. T., 379, 380.
 Courtenay-Dunn, J., 260.
 Courtney, D. S., 241, 242.
 Courtney, E., 524.
 Covell, W. P., 842.
 Cover, S., 564.
 Coville, F. V., 55.
 Cowan, E. K., 788.
 Cowan, F. T., 358.
 Cowan, R., 242.
 Coward, K. H., 566, 888.
 Cowden, T. K., 857, 858.
 Cowdery, K., 699.
 Cowdry, E. V., 381.
 Cowgill, G. R., 443.
 Cowing, M. V., 134.
 Cowles, M. L., 717.
 Cox, G. A., 833.
 Cox, H. R., 535.
 Cox, R. W., 714.
 Cox, W. M., Jr., 424.
 Crabb, G. A., 315.
 Craig, R., 367.
 Craig, W. T., 758.
 Cralley, E. M., 345, 787.
 Cram, E. B., 214, 215, 688.
 Crampton, E. W., 85, 373.
 Crandall, F. K., 184.
 Crane, A. G., 143.
 Crane, H. L., 484, 485, 648.
 Crane, J., 853.
 Cranor, K., 285, 424.
 Crawford, C. W., 91.
 Crawford, L. A., 401.
 Crawford, R. F., 207.
 Creager, D. B., 630.
 Creech, G. T., 33, 841.
 Creel, C. W., 144.
 Cressman, A. W., 76, 654.
 Cribbett, R., 520.
 Criswell, J. F., 853.
 Cromer, C. O., 831.
 Crompton, C., 698.
 Crooks, K. B. M., 537.
 Crosby, C. R., 501.
 Crosier, W., 348, 353.
 Cross, C. B., 315.
 Crowell, M. F., 822.
 Crown, R. M., 316.
 Crowther, E. M., 320.
 Crowther, F., 610.
 Cruess, W. V., 6.
 Crumb, S. E., 232.
 Csonka, F. A., 5, 87.
 Cuillé, 257.
 Culbertson, C. C., 755, 757,
 822, 854.
 Culbertson, J. O., 323.
 Culpepper, C. W., 621.
 Cumings, G. A., 315, 470.
 Cummins, J. E., 650.
 Cunningham, B., 679.
 Cunningham, O. C., 234,
 832.
 Curran, C. H., 228.
 Currie, G. A., 221.
 Currie, J. R., 267.
 Curry, A. S., 39.
 Curtis, G. H., 444.
 Curtis, H. E., 25.
 Curtis, L. C., 429.
 Curtis, L. R., 377.
 Cushing, E. C., 815.
 Cushman, R. A., 820.
 Cutler, J. S., 608.
 Cuvillier, E., 214, 215.
 Czarnetzky, E. J., 291.
 Daane, A., 298, 316.
 da Costa Lima, A., 664
 da Fonseca, F., 821.
 Daggett, S., 713.
 Dague, C. I., 741.
 Dahl, A. S., 630.
 Dahlberg, A. C., 101, 376,
 377, 379, 429, 524, 525,
 684.
 Dam, H., 520.
 Damodaran, M., 5.
 Dana, B. F., 488.
 Daniel, C., 266.
 Daniel, D., 667.
 Daniel, E. P., 730.
 Daniels, L. B., 225.
 Dann, W. J., 152, 283, 685.
 Danneel, R., 756.
 Darby, H. H., 816.
 Darling, F. F., 462.
 Darling, J. N., 500.
 Darlow, A. E., 517.
 Darrow, G. M., 340, 482,
 624.
 Dash, J. S., 808.
 Dauberschmidt, K., 217.
 Daubney, R., 386, 691.
 Dauphiné, A., 594.
 Dauphinee, J. A., 12.
 Dave, B. B., 599.
 Dave, C. N., 681.
 Davel, H. B., 832.
 Davenport, S. L., 358.
 Davidson, J., 220.
 Davidson, J. B., 544, 743,
 846.
 Davidson, J. G., 319.
 Davidson, O. W., 339.
 Davidson, P. B., 722.
 Davidson, R. W., 356.
 Davidson, S., 573.
 Davidson, V., 152.
 Davidson, W. M., 517.
 Davies, A. W., 584.
 Davies, B., 376.
 Davies, C., 59, 705.
 Davies, E., 134.
 Davies, J. G., 318.
 Davies, J. L., 267.
 Davies, R., 782.
 Davies, R. O., 607.
 Davies, W. L., 527.
 Davis, A. C., 511.
 Davis, C. C., 3.
 Davis, F. E., 122.
 Davis, F. L., 315.
 Davis, G. N., 788.
 Davis, H. A., 517.
 Davis, H. J., 823.
 Davis, H. P., 97, 834.
 Davis, J., 312.
 Davis, J. G., 527.
 Davis, J. J., 194, 216, 806.
 Davis, K., 486.
 Davis, L. D., 190, 480.
 Davis, L. E., 305.
 Davis, L. L., 641.
 Davis, M. B., 343.
 Davis, R. L., 179, 324, 471.
 Davis, R. O. E., 21.
 Davis, W. H., 630.
 Dawe, C. V., 266.
 Dawsey, L. D., 76.
 Dawson, J. R., 466.
 Dawson, P. R., 494.
 Day, A. M., 72.
 Day, L. H., 481.
 Day, P. L., 727, 730.
 Day, R. K., 55.
 de Almeida, J. L., 697.
 de Alwis, E., 666.
 Dean, H. T., 726.
 Dearden, D. V., 527.
 Dearing, C., 624.
 De Benedetti, A., 662.
 Debonéra, G., 258.
 de Bujanda, E. M., 857.
 Decker, G. C., 78, 788, 806.
 Decker, S. W., 776, 782, 783.
 Deen, J. L., 193.
 De Freitas, J. F. T., 697.
 de Gryse, J. J., 227.
 de Jesus, Z., 821.
 Delano, F. A., 2, 146.
 De Leur, F. M., 692.
 Delez, A. L., 104.
 Delire, A., 585.
 DeLong, D. M., 656.
 Delwiche, E. J., 477.
 Demandt, E., 324.
 Demaree, J. B., 648, 649.
 Deming, G. W., 323.
 Demole, V., 887.
 DeMoss, W. R., 33, 464.
 Dennis, F. S., 266.
 Dennis, R. W. G., 637.
 Denny, F. E., 296.
 de Ong, E. R., 513, 633.
 Deotto, R., 732.
 de Peyerimhoff, P., 218.

- De Rényi, G. S., 605.
 Derleth, C., Jr., 144.
 Des Ligneris, M. J. A., 538.
 DeVaney, G. M., 138.
 Dewar, M. M., 723.
 De Wildt, J. C. de R., 234.
 Dhar, N. R., 164.
 Dharmalingam, S., 765.
 Dharmani, L. C., 673.
 Dhinra, D. R., 440.
 Dib, M. El, 180.
 Dickens, F., 153.
 Dickinson, C. G., 105, 840.
 Dickinson, S., 155.
 Dickson, A. D., 630.
 Dickson, A. M., 553.
 Dickson, J. G., 467, 489, 630.
 Dickson, W. F., 681.
 Diehl, H. C., 477, 626, 777.
 Diehl, W. W., 60.
 Dietz, S. M., 757, 787.
 Dietz, W. H., 868.
 Dikmans, G., 214, 840.
 Dilts, M. E., 574.
 Dimick, R. E., 72, 74, 654.
 Dimock, A. W., 633.
 Dingemanse, E., 423.
 Dippenaar, B. J., 489, 630.
 Dirks, H. B., 143.
 Dixey, R. N., 266, 552.
 Dixon, H. M., 853.
 Dji-Lih Bao, 873.
 Doan, F. J., 831.
 Doane, D. H., 853.
 Doane, G. H., 144.
 Doebbeling, S. E., 442.
 Doehlert, C. A., 47, 75.
 Dolan, M., 151.
 Dols, M. J. L., 237.
 Dominguez, F. A. L., 286.
 Donald, L., 346.
 Donaldson, J. W., 704.
 Donatien, A., 254.
 Doncaster, J. P., 197.
 Doneen, L. D., 473.
 Donelson, E. G., 727, 728.
 Doner, M. H., 502, 667.
 Donham, C. R., 384, 388, 532.
 Donk, E. C. Van, 560.
 Donohoe, H. C., 73, 365.
 Doolittle, S. P., 498.
 Dopp, E., 63, 349.
 Dorcas, M. J., 245, 378, 683.
 Dorman, R., 216.
 Dormer, W. C., 798.
 Dorrance, A. B., 762.
 Dorsey, M. J., 188, 189.
 Douglas, L. H., 72.
 Douglass, R., 727.
 Doutre, L. R., 241.
 Dove, W. E., 689.
 Dover, C., 359, 658.
 Dow, G. F., 406.
 Dowd, O. J., 620.
 Down, E. E., 631.
 Downham, K. D., 698.
 Downs, P. A., 834.
 Dowson, V. H. W., 170.
 Draghetti, A., 596.
 Draize, J. H., 251, 381, 736.
 Drake, C. J., 788, 806.
 Drake, T. G. H., 522.
 Drayton, F. L., 630.
 Drechsler, C., 635.
 Drewes, H., 328.
 Drexel, H., 872.
 Drigalski, W. V., 882.
 Driggers, B. F., 74.
 Drisko, J. B., 264.
 Drummond, J., 29.
 Drummond, J. C., 8, 280, 413, 565, 882.
 Dryden, J., 895.
 Dryden, W. H., 94.
 Dubacquié, J., 802.
 Dubois, C., 254.
 Duddy, E. A., 856.
 Dufrenoy, J., 58, 630, 643.
 Dufrenoy, M. L., 58.
 Dugas, A. L., 80, 84.
 Duggar, J. F., 610, 761.
 Dulac, J., 802.
 Dulin, T. G., 38.
 Dumazert, C., 422.
 Dumbleton, L. J., 362.
 Dummeier, E. F., 401.
 Duncan, G. A., 552.
 Duncan, J. F., 579.
 Duncan, O. D., 401.
 Dundas, B., 632.
 Dunegan, J. C., 646.
 Dunham, R. S., 615, 816.
 Dunham, W. E., 575, 666.
 Dunin, M. S., 177.
 Dunlap, A. A., 429, 593.
 Dunlop, G., 519, 670.
 Dunn, G. E., 160.
 Dunn, J. C., 260.
 Dunn, L. C., 463.
 Dunn, M. S., 437.
 Dunnett, G. S., 267.
 Dunnwald, T. J., 193.
 Durant, A. J., 528.
 Durham, G. B., 784.
 Dustman, R. B., 188.
 Dutcher, R. A., 245, 678, 879.
 Du Toit, M. S., 747.
 du Toit, R. M., 529.
 Dutt, N. L., 606.
 Duvel, J. W. T., 556.
 Dye, A. P., 772.
 Dye, M., 144.
 Eagar, J. A., 316, 327.
 Earl, W. B., 528.
 Earle, I. P., 87.
 Earle, S. B., 144.
 East, E. M., 169.
 Eaton, E. D., 794.
 Eaton, L. S., 220.
 Eaton, W. H., 375.
 Ebeling, W., 226, 233, 514, 660.
 Echegaray, M., 896.
 Eckerson, S. H., 292.
 Eckles, W. C., 101, 247, 525.
 Eddins, A. H., 346.
 Eddy, C. O., 219.
 Eddy, J. R. D., 846, 847.
 Eddy, W. G., 241.
 Eddy, W. H., 888.
 Eder, H. L., 878.
 Edgar, A. D., 116.
 Edgar, J., 615.
 Edgar, R., 893.
 Edge, E. R., 213.
 Edgerton, C. W., 766.
 Edin, H., 831.
 Edisbury, J. R., 564, 584.
 Edlefsen, N. E., 449, 745.
 Edmond, J. B., 330, 772.
 Edmonds, J. L., 91.
 Edson, H. A., 432.
 Edwards, F. R., 370, 372.
 Edwards, T. I., 330.
 Edwards, W. D., 654.
 Eguchi, M., 218.
 Ehlers, D. P., 108.
 Ehrlich, J., 630, 659.
 Einset, O., 774.
 Eisenmenger, W. S., 150.
 Elder, C., 385, 528, 840.
 El Dib, M., 180.
 Eldredge, J. C., 757.
 Elford, W. J., 691, 697.
 Ellenbogen, V., 387.
 Ellenwood, C. W., 47.
 Ellington, E. V., 242.
 Elliott, C., 431, 630.
 Elliott, F. J., 516.
 Ellis, L. S., 401, 553, 707.
 Ellison, J. M., 274.
 Ellisor, L. O., 656.
 Ellsworth, J. K., 359.
 Elmore, J. C., 511.
 Elting, E. C., 243, 315, 831.
 Elvehjem, C. A., 515, 559, 560.
 Elvey, C. T., 160.
 Elvove, E., 726.
 Elze, D. L., 802.
 Embody, G. C., 807.
 Émerique, L., 417.
 Emerson, R. A., 309, 758, 770.
 Emmel, M. W., 695, 843.
 Emmerie, A., 443.
 Emmert, E. M., 155, 455.
 Emoto, O., 250.
 Emsweller, S. L., 328, 545, 753.
 Ender, F., 586.
 Enderlein, G., 217.
 Endo, S., 203.
 Enger, M. L., 143.
 Engle, E. T., 465.

- Engle, R. F., 229.
 Engledow, F. L., 767.
 Englehorn, A. J., 743.
 Englund, E., 577.
 Enlow, C. R., 34.
 Ensign, M. R., 316, 327.
 Enzie, W. D., 329, 477.
 Enzmann, E. V., 314.
 Eppley, G., 36.
 Eppson, H. F., 251.
 Epstein, A. A., 891.
 Epstein, H., 32.
 Erb, E. S., 831.
 Erbe, F., 640.
 Erdélyi, J., 739.
 Erdman, H. E., 856.
 Erikson, A. B., 526.
 Erickson, B. N., 728, 871.
 Erickson, C. I., 243.
 Erickson, R. M., 448.
 Erlanson, E. W., 783.
 Ernest, E. C. M., 458.
 Errington, P. L., 699, 804.
 Erwin, A. T., 757, 769.
 Esau, K., 43, 353, 594, 633.
 Escherich, K., 217.
 Eshbaugh, F. P., 143.
 Eskew, W. C., 431.
 Espe, D. L., 523, 830.
 Espe, O. W., 243.
 Espino, R. B., 593.
 Esplin, 371.
 Essex, H. E., 261.
 Essig, E. O., 54, 368, 501, 512.
 Etchells, J. L., 834.
 Etheridge, W. C., 466.
 Ethridge, B., 736.
 Evans, A. C., 229.
 Evans, E. I., 95, 283.
 Evans, H. M., 584, 604, 605, 874, 890.
 Evans, J. A., 216.
 Evans, J. W., 222.
 Evans, R. E., 234.
 Evans, R. J., 347.
 Evans, S. A., 529.
 Evans, U. R., 848.
 Eveleth, D. F., 372.
 Evers, H. F., 416.
 Ewbank, E. K., 16.
 Ewing, H. E., 214.
 Eyraud, 102.
 Eyster, W. H., 752.
 Ezekiel, M., 2, 118.
 Ezekiel, W. N., 345, 794.
 Ezell, B. D., 337, 479, 777.
 Ezell, H. O., 501.
 Fabian, F. W., 157, 286.
 Faes, H., 623.
 Fagan, F. N., 776.
 Fagan, T. W., 317.
 Fahringer, J., 217.
 Fairbank, J. P., 263.
 Fairbanks, F. L., 823, 846.
 Faires, E. W., 831.
 Fajardo, T. G., 210, 212, 820.
 Falconer, J. I., 272, 547, 853, 861.
 Farden, C. A., 11, 782.
 Fargo, J. M., 515, 526.
 Faris, J. A., 630.
 Farley, G. H., 242.
 Farr, D., 700.
 Farr, W. K., 292, 593.
 Farrell, F. D., 143, 148.
 Farris, N. F., 36.
 Faulkner, B., 614.
 Fawcett, H. S., 632, 633.
 Fedde, M. S., 144.
 Fedorov, E. E., 12.
 Fedorova, N. I., 754.
 Fedotova, T. I., 637.
 Feldman, H., 560.
 Feldman, W. H., 390, 838.
 Felix, E. L., 640.
 Fellers, C. R., 191, 880.
 Fellows, H., 791.
 Fellows, H. C., 326.
 Feltham, L. R. M., 381.
 Felton, W. R., 517.
 Fenstermacher, R., 694.
 Fenton, F. A., 224.
 Ferguson, J. A., 785.
 Ferguson, O. J., 144.
 Fernier, L., 664.
 Fernow, K. H., 788.
 Ferry, J. D., 845.
 Ferry, Q. B., 257.
 Fieger, E. A., 454.
 Field, F. V., 269.
 Fifield, C. C., 868.
 Fifield, W. M., 316, 327.
 Fikry, A., 645.
 Filmer, R. S., 84.
 Finch, A. H., 483, 486.
 Findlay, G. M., 804.
 Findlay, W. M., 66.
 Findlay, W. P. K., 211.
 Fine, J., 564.
 Fink, D. S., 449, 591.
 Finnemore, H., 689.
 Finzi, G., 255.
 Fisher, C. K., 73, 365.
 Fisher, G., 144.
 Fisher, L. C., 741.
 Fisher, R. A., 14.
 Fisher, V., 285.
 Fitch, C. P., 384, 532.
 Fitch, J. B., 430.
 Fitz Gerald, D. A., 267.
 Fitzgerald, M., 117.
 Fitzpatrick, T. J., 318.
 Flanders, S. E., 73, 370, 501.
 Flanigan, G. E., 378, 525.
 Flanley, M. G., 243.
 Flegontova, A. A., 838.
 Fleischmann, R., 174.
 Fleming, A., 689.
 Fleming, W. D., 423.
 Fleming, W. E., 80, 81, 230.
 Fletcher, J. L., 315, 523.
 Fletcher, L. A., 775.
 Fletcher, M. G., 416.
 Fletcher, R. K., 329.
 Flint, W. P., 654, 778.
 Florell, V. H., 614.
 Fluke, C. L., 501, 502, 509.
 Fluke, C. L., Jr., 814.
 Foex, E., 644.
 Fogleman, J. B., 736.
 Folger, A., 377.
 Follett-Smith, R. R., 178.
 Folley, S. J., 155.
 Folsom, D., 495, 630.
 Folsom, J. W., 77, 221.
 Fonseca, F. da, 821.
 Forbes, E. B., 371, 736, 823.
 Ford, O. W., 25.
 Formozov, A. N., 651.
 Forsling, C. L., 541.
 Foster, A. C., 488.
 Foster, E., 486.
 Foster, J. C., 518.
 Foster, L. G., 122.
 Foulkrod, G. M., 546.
 Fouts, E. L., 524, 684.
 Fowells, H. A., 161.
 Fowler, E. D., 48, 648.
 Fox, L. E., 593.
 Föyn, N. J., 446.
 Frame, B. H., 547.
 France, R. L., 525, 527.
 Francis, D. S., 457.
 Francis, L. D., 419.
 Francis, P. A., 829.
 Frandsen, J. H., 381.
 Frank, N. A., 575.
 Franke, K. W., 92, 252, 294.
 Franzke, C., 178.
 Fraps, G. S., 238, 244, 315, 592.
 Frary, F. C., 701.
 Fraser, R. R., 303.
 Frauendorfer, S. von, 699.
 Frayer, J. M., 100.
 Frayser, M. E., 573.
 Frazer, A. C., 758.
 Frazier, W. C., 95, 686.
 Fred, E. B., 27, 436, 448, 745.
 Freeborn, S. B., 388.
 Freeman, R. C., 285.
 Freer, R. S., 432.
 Freilich, J., 867.
 Freire, C. V., 598.
 Freitag, J. H., 348.
 Freitas, J. F. T. de, 697.
 French, A. P., 335.
 French, M. P., 144.
 French, O. C., 544.
 Freney, M. R., 367.
 Frey, C. N., 97.
 Frey-Wyssling, A., 750.
 Friebe, P., 798.
 Friedberg, L., 44.

- Friedberg, R., 44.
 Friedenwald, J., 891.
 Friend, W. H., 328, 781.
 Frolik, A. L., 45.
 Fromme, F. D., 144, 209, 735.
 Fron, G., 641.
 Frost, R. L., 13, 742.
 Frost, S. W., 807.
 Fry, C. L., 272.
 Frye, B. C., 630.
 Fudge, B. R., 347.
 Fudge, J. F., 345.
 Fukushima, T., 250.
 Fulghum, R., 260.
 Fullarton, R., 725.
 Fuller, J. G., 515, 526.
 Fuller, M. E., 510, 657.
 Fulmer, E. I., 739.
 Funk, E. M., 173, 240, 514, 515, 519.
 Furr, J. R., 192.
 Furry, M. S., 139.
 Furth, J., 108.
 Gabriel, H. S., 555.
 Gaddum, L. W., 5, 327, 413, 781.
 Gadre, K. M., 12.
 Gaessler, W. G., 739, 757.
 Gahan, A. B., 370.
 Gahan, J. B., 508.
 Gaines, J. C., 77.
 Gaines, R. C., 82, 117.
 Gaines, W. L., 523.
 Gaier, J. L., 243.
 Galbraith, J. K., 272, 713.
 Galigani, D., 732.
 Gallagher, T. F., 756.
 Gallástegui, C., 798.
 Gallemore, D. I., 416.
 Galligan, W. E., 117.
 Galloway, I. A., 691.
 Galpin, C. J., 557.
 Gamble, J. A., 87.
 Gambrell, F. L., 230, 506.
 Ganguli, P. M., 169.
 Gans, A. R., 408.
 Garcia-Mata, C., 740.
 Gardner, E. L., 281.
 Gardner, F. D., 831.
 Gardner, F. W., 281.
 Gardner, J. C. M., 511.
 Gardner, L. R., 812.
 Gardner, M. W., 431, 632.
 Gardner, V. R., 144.
 Gardner, W., 111, 299, 539, 700.
 Gardner, W. U., 464.
 Garlock, F. L., 118.
 Garman, P., 216, 232, 429.
 Garner, R. J., 332.
 Garner, W. W., 613.
 Garnett, W. E., 274.
 Garrett, S. D., 350.
 Garrison, A., 727.
 Garrison, E. R., 524, 525.
 Gassner, G., 62, 800.
 Gaudineau, M., 644.
 Gault, L., 25.
 Gause, G. F., 217.
 Gauss, J. R., 855.
 Geach, W. L., 644.
 Geddes, J. A., 127.
 Geddes, W. F., 325, 867.
 Gedeonov, A. D., 12.
 Geiger, R., 216, 446.
 Geisler, C. D., 702.
 Genther, I. T., 604.
 Genung, E. F., 155.
 Georgi, C. E., 751.
 Gerhardt, F., 337, 479.
 Gericke, W. F., 473.
 Gerlach, F., 102.
 Gerlach, W., 640.
 Gershoy, A., 31.
 Geyelin, H. R., 891.
 Gheorghiu, I., 636.
 Gibbins, E. G., 816.
 Gibbs, C. S., 240, 259.
 Gibson, A., 228.
 Gibson, G. G., 755.
 Gibson, J. S., 160.
 Gidley, J. W., 650.
 Giersbach, J., 342.
 Giese, H., 757, 769, 846.
 Giesecke, F. E., 846, 847.
 Giesecker, L. F., 160.
 Gifford, C. G., 858.
 Gilbert, B. E., 27.
 Gilbert, C. S., 251, 381.
 Gilbert, S. J., 391, 694.
 Gilbertson, G. I., 79.
 Gildehaus, E. J., 476.
 Gilding, H. P., 882.
 Gilgut, C. J., 630.
 Gill, D. L., 788.
 Gillette, C. P., 659.
 Gillette, H. S., 702.
 Gilman, H., 387.
 Gilman, J. C., 787.
 Gilmore, A. B., 612.
 Gilmore, J., 242.
 Gilmore, L. N., 823.
 Gilmour, G. S., 241.
 Gilson, W. I., 262.
 Giltner, W., 382.
 Ginsburg, J. M., 75, 228, 505, 656.
 Ginter, A. E., 573.
 Giroud, A., 421.
 Gisborne, H. T., 55, 488.
 Givman, L. S., 177.
 Givens, J. W., 521.
 Glanville, W. H., 396.
 Glanzmann, E., 870.
 Glaser, R. W., 227.
 Glasgow, H., 367.
 Gleason, M., 560.
 Glick, D., 441.
 Glover, L. H., 656.
 Glover, P. M., 667.
 Gluco, B., 319.
 Goar, L. G., 14, 34, 46.
 Gochenour, W. S., 837.
 Godbey, E. G., 823.
 Godfrey, A. B., 237.
 Godfrey, G. H., 70, 633, 650.
 Goff, C. C., 358.
 Goffart, H., 500.
 Gokhale, D. H., 591.
 Goldberg, J. A., 571.
 Goldberg, S. A., 390.
 Goldhamer, S. M., 892.
 Goldie, A. H. R., 158.
 Golding, N. S., 242, 243, 525.
 Goldschmidt, R., 813.
 Gomez, E. T., 33, 172, 464.
 Gomez-Vega, P., 283.
 Goode, G. P., 7.
 Goodey, T., 212.
 Goodman, L., 313, 314.
 Goodspeed, T. H., 461.
 Goodwin, G. P., 419.
 Goodwin, W., 67.
 Goodwin, W. I., 713.
 Gopala Rao, G., 163.
 Gordon, H. McL., 382.
 Gordon, R., 377.
 Gordon, W. S., 250.
 Goresline, H. E., 117.
 Gorter, F. J., 284.
 Goss, D. M., 38.
 Gossard, A. C., 484.
 Gosset, A., 802.
 Gösswald, K., 217.
 Göthlin, G., 886.
 Göthlin, G. F., 422.
 Gough, G. A. C., 150.
 Goujon, G., 159.
 Gould, S. A., 330.
 Goulden, C. H., 325, 615.
 Gourley, J. H., 47.
 Gowen, J. W., 244, 681, 682.
 Graber, L. F., 37, 489, 502.
 Graf, H., 530.
 Graf-Marin, A., 199.
 Graham, R., 391, 538, 841.
 Graham, W. R., Jr., 98, 236.
 Grandori, L., 29.
 Grandori, R., 29.
 Graner, E. A., 755.
 Granett, P., 75.
 Grant, R. T., 40.
 Grantham, G. M., 161.
 Grasoovsky, A., 210.
 Gratz, L. O., 316, 347.
 Grau, F. V., 46.
 Graul, E. J., 466, 502.
 Graves, E. F., 529.
 Graves, P. E., 855.
 Graves, R. R., 33, 523.
 Gray, D. T., 143, 894.
 Gray, K., 654.
 Gray, L. C., 3, 146, 853.

- Gray, L. G., 741.
 Gray, R. B., 702.
 Greaney, F. J., 630, 631.
 Greaves, J. E., 298, 316, 371, 413, 452.
 Green, C. V., 170, 602.
 Green, H. H., 102.
 Green, R. G., 699.
 Green, R. M., 431.
 Greene, D., 568.
 Greene, E. W., 447.
 Greene, H. C., 460.
 Greene, H. S. N., 171, 257, 465.
 Greene, S. W., 370.
 Greengard, H., 892.
 Greenleaf, F. M., 242.
 Greenwood, D. A., 689.
 Gregg, W. R., 297.
 Gregory, E., 565.
 Gregory, F. G., 320.
 Gregory, H. H. C., 278.
 Grest, E. G., 862.
 Greulich, W. W., 466.
 Griffith, M. E., 893.
 Griffiths, D., 55.
 Griffiths, E., 130.
 Grigsby, B. H., 750.
 Grijns, G., 423.
 Grimes, F. G., 356, 650.
 Grimes, J. C., 376.
 Grimes, M., 527.
 Griswold, C. L., 228.
 Griswold, G. H., 74, 807.
 Gross, C., 5.
 Gross, E. R., 110, 117.
 Grubb, N. H., 338.
 Gruber, F., 777.
 Grütz, O., 571.
 Gryse, J. J. de, 227.
 Guba, E. F., 497, 630.
 Guarrant, N. B., 245, 879.
 Guilbert, H. R., 86, 87.
 Guild, R., 722.
 Guillot, J., 739.
 Guin, M., 855.
 Gulati, A. N., 177.
 Gulick, M., 871.
 Gunn, D. L., 362.
 Gunn, K. C., 493, 621.
 Gunness, C. I., 160, 448, 742.
 Gurin, C. Z., 888.
 Gurney, W. B., 656.
 Güssow, H. T., 432.
 Gustafson, A. F., 15, 303.
 Gustafson, F. G., 51.
 Gustafson, S. G., 241.
 Gustafsson, Y., 288.
 Gustchin, G. G., 42.
 Gustus, E. L., 604.
 Guterma, C. E. F., 788.
 Guthrie, E. S., 99, 524, 830.
 Guthrie, J. D., 593.
 Guthrie, L. J., 742.
 Guthrie, M. J., 465.
 Gutteridge, H. S., 460, 520.
 Gwatkin, R., 690, 838.
 György, P., 282.
 Haag, H. M., 411.
 Haag, J. R., 372.
 Haas, A. R. C., 507.
 Haasis, F. A., 647, 788.
 Haasis, F. S., 628.
 Haber, E. S., 329, 330, 769, 771, 866.
 Haber, V. R., 785.
 Haberland, H. F. O., 688.
 Hackbarth, J., 752.
 Hackedorn, H., 89.
 Hadley, F. B., 529.
 Hadley, F. P., 733.
 Hadwen, S., 213.
 Haenseler, C. M., 69.
 Hagan, H. R., 70.
 Hagan, W. A., 106.
 Haida, K., 277.
 Haines, R. T. M., 8.
 Hale, G. A., 315.
 Hale, R. F., 118.
 Hales, M. W., 248, 525.
 Hall, A. D., 579.
 Hall, D. G., 689.
 Hall, E. E., 331, 612, 758.
 Hall, G. N., 530.
 Hall, G. O., 171, 823.
 Hall, H. G., 35, 141.
 Hall, M. C., 529, 840.
 Hall, O. J., 861.
 Hall, R. C., 786.
 Hall, S. A., 525.
 Hall, W. C., 85, 515.
 Haller, F. W., 183.
 Haller, H. L., 503.
 Halliday, E. G., 866.
 Halliday, N., 884.
 Halloway, M., 727.
 Halma, F. F., 341, 483.
 Halpin, J. G., 515, 529.
 Hamamura, E. K., 304.
 Haman, R. W., 560.
 Hambidge, G., 869.
 Hamerstrom, F. N., 215.
 Hamilton, A., 364.
 Hamilton, C. C., 74, 506, 513.
 Hamilton, C. H., 854.
 Hamilton, H. G., 120.
 Hamilton, S. N., 319, 608.
 Hamilton, W., 819.
 Hamilton, W. H., 2, 146.
 Hamilton, W. J., Jr., 804.
 Hamlin, C. H., 284.
 Hamlin, H. M., 863.
 Hammar, C. H., 547, 708.
 Hammer, B. W., 243, 683, 830.
 Hammond, G. H., 231.
 Hammond, J., 235.
 Hamner, K. C., 626.
 Hampson, C. C., 122.
 Hampson, C. M., 268, 269.
 Hance, F. E., 21, 304.
 Hand, I. F., 159.
 Hanes, C. S., 6.
 Hanford, Z. M., 523, 525.
 Hankins, O. G., 87.
 Hanley, F., 770.
 Hannay, A. M., 403, 854.
 Hansen, C. J., 338.
 Hansen, H. C., 241, 377, 430.
 Hansen, H. N., 632, 633, 635.
 Hansen, P. A., 105.
 Hansford, C. G., 320, 351.
 Hanson, F. E., 526.
 Hanson, H. C., 326, 759.
 Hanson, K. B., 539.
 Hanson, L. W., 242.
 Harde, E., 417, 421, 886.
 Hardenburg, E. V., 704, 758.
 Harding, P. L., 620.
 Harding, V. J., 157, 724.
 Hardy, F., 324.
 Hardy, J. I., 139.
 Hardy, M. B., 485.
 Hargreaves, H., 320, 655.
 Haring, C. M., 842.
 Harrington, C. R., 437.
 Harkness, D. A. E., 266.
 Harlan, H. V., 37.
 Harlan, J. D., 335, 336.
 Harland, S. C., 310, 320.
 Harley, C. P., 67, 619.
 Harman, M. T., 886.
 Harmon, F. N., 622.
 Harmon, G. W., 474.
 Harms, H., 460.
 Haroon Khan, M., 227.
 Harper, F. H., 321, 854.
 Harrington, C. F., 102.
 Harrington, J. B., 600.
 Harris, A. W., 433.
 Harris, H. M., 78, 224, 806.
 Harris, J. W., 144.
 Harris, L., 575.
 Harris, L. J., 568, 586, 731.
 Harris, W. V., 655.
 Harrison, A. S., 369.
 Harrison, D. C., 567.
 Harrison, E. S., 524, 830.
 Harrison, L. P., 159, 742.
 Harshfield, G. S., 388.
 Hart, E. B., 378, 515, 559, 560.
 Hart, G. H., 86.
 Hart, H., 373, 602.
 Harter, L. L., 352, 498, 640.
 Hartley, C., 630.
 Hartman, J. D., 322.
 Hartt, C. E., 308.
 Hartzell, A., 503.
 Harukawa, C., 363.
 Harvey, H. E., 890.
 Harwood, E. M., 589.
 Harwood, P. D., 815.
 Haseman, L., 501, 808.
 Hashimoto, K., 250.
 Hassebrauk, K., 800.

- Hastings, E. G., 526, 837, 694.
Hastings, R. J., 59.
Hatch, A. B., 630.
Hatch, K. L., 143.
Hatfield, G. H., 407.
Hathaway, I. L., 97.
Hatton, R. G., 332.
Hauck, C. W., 411.
Hauck, H. M., 879.
Hauge, S. M., 235, 523.
Haut, I. C., 478.
Haven, G. B., 893.
Havis, L., 47, 48, 575, 772.
Hawkins, L. A., 74.
Hawkins, S., 347.
Hawthorn, L. R., 183, 329.
Haydak, M. H., 83, 502.
Hayden, C. E., 692.
Hayes, H. K., 288.
Hays, C. H., 102.
Hays, F. A., 519, 521.
Hazen, M., 514.
Headlee, T. J., 74, 228, 660.
Heald, F. D., 67, 354.
Healy, D. J., 431.
Heane, C. W., 535.
Heath, O. V. S., 320.
Hebard, M., 658.
Heberdey, R. F., 359.
Hecht, O., 216.
Heck, A. F., 23, 746.
Heckart, S. R., 854.
Hedden, O. K., 851.
Hedden, R. S., 699.
Hedden, W. P., 853.
Hedlund, G. W., 855.
Hedrick, U. P., 735.
Hedström, H., 105.
Hefebower, R. B., 242, 243, 401.
Heiman, V., 823.
Heimbeck, L., 630.
Heimbürger, C. C., 785.
Hein, M. A., 87, 179.
Heinicke, A. J., 773.
Heintzleman, B. F., 804.
Heller, V. G., 238, 371, 517, 824.
Helser, M. D., 822, 854.
Hemmi, T., 199, 203, 207, 210, 211.
Henderson, E. W., 755, 822, 843.
Henderson, H. O., 523.
Henderson, J. L., 377, 524.
Henderson, M., 275.
Henderson, R. G., 630.
Henderson, W. J., 787, 788.
Hendricks, W. A., 520, 678.
Hendrickson, A. H., 340.
Hendry, F. W. F., 611.
Hendry, G. W., 635.
Henika, F. S., 467.
Hening, J. C., 101, 525, 680.
Henke, L. A., 373, 831.
Henley, W. W., 371, 695.
Henner, J., 459.
Hennerty, A. J., 527.
Henning, W. L., 91, 823.
Henriques, V., 623.
Henry, A. T., 216.
Henry, Y., 16.
Hensill, G. S., 77.
Henson, E. R., 757.
Henwood, P. E., 112.
Hepburn, G. A., 664, 809.
Hepner, F. E., 589.
Herbert, F. B., 360.
Hering, M., 365.
Heriot, A. D., 806.
Herman, H. A., 501, 524, 525.
Hermano, A. J., 282.
Herms, H. P., 390.
Herms, W. B., 359, 366, 389, 506.
Herold, W., 217.
Herr, A. T., 144.
Herr, E. A., 221.
Herreid, E. O., 380, 524.
Herrick, C. A., 529, 688.
Herrick, E. M., 593.
Herrick, G. W., 807, 810.
Herrington, B. L., 293, 584.
Hershey, A. E., 113.
Hertz, R., 313.
Herzer, F. H., 375.
Hess, K., 733.
Hester, J. B., 182, 184, 745.
Hetherington, A., 382.
Heuberger, J. W., 40, 630, 631.
Heuser, G. F., 823.
Hewitt, A. C. T., 463, 601.
Hewitt, E. A., 689.
Hewitt, J. L., 633.
Hibbard, A. D., 311, 476.
Hibbard, P. L., 478.
Hibbard, R. P., 750.
Hickman, C. W., 825.
Hicks, C. H., 360.
Higgins, B. B., 801.
Higgins, G. M., 828.
Higgins, W. A., 260, 679.
Higgy, R. C., 144.
Hilborn, M. T., 354.
Hildebrand, E. M., 187, 631, 788.
Hilgeman, R. H., 627.
Hilleman, J. L., 524.
Hill, A. B., 381.
Hill, A. V., 642.
Hill, E. B., 405.
Hill, F. F., 709, 853.
Hill, G. F., 506.
Hill, H., 343.
Hill, H. D., 64.
Hill, J. A., 735.
Hill, O. J., 380.
Hill, R. L., 413.
Hill, S. B., Jr., 220.
Hills, G. L., 526.
Hills, J. L., 142.
Hills, K. L., 607.
Hilton, J. H., 523.
Himwich, H. E., 891.
Hinds, W. E., 80, 84.
Hines, L., 632.
Hinman, E. H., 229, 549.
Hinman, R. B., 758, 822.
Hinshaw, W. R., 87, 374.
Hinton, R. C., 267.
Hirschfeld, H., 249.
Hirschfelder, A. D., 445.
Hirst, C. T., 298, 316.
Hirst, L. F., 510.
Hisaw, F. L., 313.
Hiscox, E. R., 834.
Hitchcock, J. A., 120.
Hittmair, A., 249.
Hitz, V. E., 711.
Hixon, R. M., 739.
Hixson, E., 818.
Hoagland, C. L., 444.
Hoagland, D. R., 478, 625.
Hoblyn, T. N., 334, 335, 339.
Hobson, A., 707.
Hodge, H. M., 377.
Hodges, J. A., 854.
Hodgson, R. E., 242, 243, 523, 524.
Hodgson, R. W., 627, 779.
Hodson, A. C., 230.
Hoerner, J. L., 358.
Hoffman, I. C., 47.
Hoffman, M. B., 619, 773.
Hoffmann, G. P., 484.
Hoffmann, J. F., 36.
Hofmann, C., 216.
Hofmann, F. W., 618.
Hogan, A. G., 514, 515, 522, 564, 892.
Hogentogler, C. A., 847.
Holbert, J. R., 488, 630.
Holdaway, F. G., 229, 506.
Holden, J. A., 575.
Holiday, E. R., 156.
Hollande, A. C., 837.
Holley, K. T., 38.
Holloway, J. K., 501.
Holm, G. C., 532.
Holmboe, F. V., 534.
Holmes, A. D., 138.
Holmes, C. E., 515, 529.
Holmes, C. L., 854.
Holmes, F. O., 495, 642, 800.
Holmes, F. S., 45.
Holmes, H. N., 882.
Holth, H., 695.
Holton, C. S., 630.
Homewood, G. R. B. S., 705.
Hong, T. H., 366.
Hope, E. C., 715.
Hopfen, H. J., 400.
Hopkins, E. S., 404.
Hopkins, E. W., 459.
Hopkins, F. G., 254, 579.
Hopkins, H. L., 2, 146.
Hopkins, J. A., Jr., 124, 854.
Hopkins, J. W., 85, 298, 373.

- Hopkins, S. J., 436.
 Hoppe, P. E., 488.
 Horat, L. E., 25.
 Horio, S., 601.
 Horlacher, L. J., 143.
 Hornby, H. E., 529.
 Horne, W. T., 630.
 Horner, G. M., 448.
 Horrall, B. E., 524.
 Horsfall, F., Jr., 479, 622.
 Horsfall, J. G., 630, 635, 638, 791, 796.
 Horst, K., 873.
 Horton, G., 659.
 Horton, M. F., 144.
 Hoshino, H. M., 650.
 Hosking, H. R., 320.
 Hoskins, J. D., 144.
 Hoskins, M., 531.
 Hoskins, W. M., 367, 369.
 Hosley, N. W., 819.
 Hosny, M., 659, 812.
 Hostetler, E. H., 370.
 Hotson, J. W., 633.
 Hough, W. S., 358.
 Houghland, G. V. C., 470.
 Houser, J. S., 233.
 Howard, A. L., 57.
 Howard, F. L., 648.
 Howat, G. R., 834.
 Howe, F. B., 15, 303.
 Howe, F. C., 3.
 Howe, G. H., 54.
 Howell, G. E., 236.
 Howell, S. F., 442.
 Howitt, B., 842.
 Howitt, B. F., 389, 841.
 Howlett, F. S., 47.
 Hrubý, K., 751.
 Hu, C. K., 171, 465.
 Hubback, C., 856.
 Hubbard, V. C., 325.
 Hubbell, D. S., 55.
 Hubbell, R. B., 724.
 Huber, L. L., 500.
 Huberman, M. A., 486.
 Hubert, E. E., 701.
 Hübner, G., 194.
 Huckenpahler, B. J., 344.
 Hucker, G. J., 105, 386.
 Hockett, H. C., 360.
 Huddleson, I. F., 382.
 Hudson, C. B., 109, 390.
 Hudson, G. V., 666.
 Hudson, J. R., 110, 386.
 Hudson, P. S., 767.
 Hudson, R. S., 236, 827.
 Hudson, S. C., 269.
 Hughes, A. E., 780, 781.
 Hughes, E. H., 373, 602.
 Hughes, H. D., 609, 743, 757, 854.
 Hughes, R. M., 144.
 Huillier, L. L., 632.
 Hulbert, H. W., 476, 764.
 Hull, F. H., 315, 316, 326.
 Hulme, B. F., 316, 327, 371.
- Hultz, F. S., 736.
 Hume, A. N., 178.
 Humphrey, G. C., 532.
 Humphrey, H. B., 432.
 Humphreys, W. J., 742.
 Humphries, W. R., 706.
 Hungerford, C. W., 488, 630.
 Hunscher, H. A., 728, 871.
 Hunter, G. W., III, 688.
 Hunter, J. E., 373, 678, 823.
 Hunter, J. H., 494.
 Hunter, W. S., 688.
 Huntington, E., 447.
 Hurd, C. J., 241.
 Hurd, E. B., 709, 854.
 Hurd-Karrer, A. M., 203.
 Hurel-Py, 597.
 Hurlbut, L. W., 848.
 Hurst, L. A., 611, 759, 770, 826, 827, 831, 894.
 Hurst, W. M., 706.
 Hurt, R. H., 210, 630.
 Hurtle, W. H., 12.
 Husain, M. A., 227.
 Huskins, C. L., 31, 169.
 Hussain, S. M., 676.
 Husseman, D., 560.
 Hussey, R. E., 706.
 Husz, B., 798.
 Hutchins, L. M., 630.
 Hutchins, W. A., 862.
 Hutchinson, D. R., 704.
 Hutchinson, E. N., 241, 242.
 Hutchinson, J. B., 310.
 Hutchison, C. B., 735.
 Hutson, J. C., 365, 662, 666.
 Hutson, R., 506.
 Hutt, F. B., 170.
 Hypes, J. L., 412.
- Iakobson, I. I., 321.
 Ibsen, H. L., 601.
 Ichijima, K., 752.
 Iddings, E. J., 141, 143.
 Ihle, J. E. W., 839, 840.
 Ihle-Landenberg, M. E., 839, 840.
 Ikeno, S., 203.
 Ikeya, J., 201.
 Ilfén (Iljin), M. P., 53.
 Illingworth, L., 819.
 Imai, Y., 339.
 Imaoka, H., 249.
 Imboden, M., 888.
 Immer, F. R., 323.
 Ing, E. G., 339.
 Ingleson, H., 547.
 Ingraham, M. A., 436, 442, 460.
 Insko, W. M., Jr., 240.
 Inukai, F., 284.
 Ioff, I., 692.
 Irons, V., 258.
 Irvin, C. J., 743.
 Irwin, D. L., 143.
 Irwin, M. H., 560.
- Isaac, L. A., 487.
 Isaac, P. V., 230.
 Isaachsen, H., 821.
 Isaacs, R., 892.
 Isely, D., 83, 806.
 Ishizawa, T., 805.
 Isler, D. A., 117.
 Israelsen, O. W., 111, 299.
 Ivan, Z., 692.
 Ivanoff, S. S., 489, 630.
 Ivey, G. F., 262.
 Ivy, A. C., 891, 892.
 Iyengar, K. G., 803.
 Iyer, A. V., 826.
- Jaaback, G., 5.
 Jaap, R. G., 32.
 Jaccard, P., 750.
 Jackman, J. W., 25.
 Jackson, F. K., 320.
 Jackson, H. C., 523, 526.
 Jackson, L. W. R., 630.
 Jacobs, A. W., 707.
 Jacobs, S. I., 882.
 Jacobsen, W. C., 653.
 Jacobson, C. O., 830.
 Jacot, A. P., 85.
 Jaffe, H. L., 891.
 Jagger, I. C., 630, 640.
 Jahn, A., 749.
 James, J. S., 14.
 James, L. H., 6, 87.
 Jameson, J. D., 320.
 Jamison, F. S., 51, 770.
 Jansen, C. E., 869.
 Jansen, J., 698.
 Janssen, G., 165, 768.
 Jaques, A. D., 228.
 Jardine, J. T., 147, 577.
 Jarvis, H., 663.
 Jary, S. G., 502, 505, 507.
 Jefferson, C. H., 263, 428.
 Jefferson, R. N., 431.
 Jeffries, C. D., 743.
 Jeffries, J. H., 327.
 Jehle, R. A., 40.
 Jemison, G. M., 57, 194.
 Jenkin, T. J., 168.
 Jenkins, A. E., 195, 631.
 Jenkins, J. M., Jr., 758, 769.
 Jenkins, L., 501.
 Jenkins, M. T., 168, 175, 757.
 Jenkins, W. B., 551.
 Jenkins, W. L., 873.
 Jennings, B. A., 846.
 Jennings, D. S., 111, 299.
 Jenny, H., 448, 451, 525, 708.
 Jensen, A., 242.
 Jensen, B. H., 693.
 Jensen, L. B., 869.
 Jensen, P. B., 597.
 Jepson, F. P., 808.
 Jesus, Z. de, 821.
 Jewett, H. H., 512.
 Job, M. M., 456.

- Joel, A. H., 15.
 Joessel, P. H., 645.
 Joffe, E. W., 102.
 Joffe, J. S., 156, 162.
 Johannsen, O. A., 510.
 Johansen, J. P., 575.
 Johansson, E., 327, 330, 337, 774, 782.
 Johansson, I., 33.
 Johnson, A. G., 252, 630, 641.
 Johnson, A. H., 248, 740.
 Johnson, C. O., 641.
 Johnson, D. W., 88.
 Johnson, E. C., 331, 403.
 Johnson, E. W., 143.
 Johnson, F. B., 343.
 Johnson, H. M., 55.
 Johnson, H. W., 204, 631.
 Johnson, J., 43, 467.
 Johnson, L. P. V., 599.
 Johnson, N. W., 119, 401, 708, 861.
 Johnson, O. R., 547.
 Johnson, P. H., 501.
 Johnson, P. O., 558.
 Johnson, R., 424.
 Jonsson, B. F., 97, 825.
 Johnson, R. H., 92.
 Johnson, S., 268.
 Johnson, S. R., 514.
 Johnson, S. W., 731.
 Johnson, W. T., 688.
 Johnston, C. O., 645.
 Johnston, E. S., 595.
 Johnston, S., 482.
 Johnston, W. H., 792.
 Johnstone-Wallace, D. B., 37, 318, 758.
 Jolly, A. L., 266, 855.
 Jones, D. B., 5, 87.
 Jones, D. F., 771.
 Jones, D. L., 470.
 Jones, E. T., 808.
 Jones, F. R., 63, 488, 489, 492.
 Jones, G. D., 501.
 Jones, H. A., 753.
 Jones, J. H., 236.
 Jones, J. M., 236.
 Jones, J. W., 641, 756.
 Jones, L. I., 317.
 Jones, L. K., 633.
 Jones, L. R., 489, 631.
 Jones, M. F., 214.
 Jones, M. G., 317.
 Jones, M. M., 86, 539.
 Jones, M. P., 80.
 Jones, S. B., 381.
 Jones, T. N., 593.
 Jones, W. H., 862.
 Jonnesco, D., 382, 837.
 Jordan, H. V., 494.
 Jorpes, E., 9, 10.
 Jortikka, M., 773.
 Joshi, N. V., 455.
 Joukovsky, P., 142.
 Judd, C. S., 786.
 Jugenheimer, R. W., 757.
 Jull, M. A., 87, 171, 240, 390, 520, 678.
 Jungherr, E., 693.
 Journey, R. C., 590.
 Justin, M., 144.
 Kable, G. W., 702.
 Kadow, K. J., 800.
 Kahlenberg, O. J., 371, 823.
 Kaiser, S., 462.
 Kaiser, W. G., 543.
 Kalabukhov (Kalabuchov), N. I., 691.
 Kalamkar, R. J., 12.
 Kalshoven, L. G. E., 218.
 Kaltenbach, D., 559.
 Kamesam, S., 666.
 Kane, E. A., 523.
 Kapp, E. M., 816.
 Kapp, L. C., 743, 787.
 Kardos, L. T., 156.
 Karmarkar, D. V., 342, 479.
 Karper, R. E., 470.
 Karrer, A. M. H., 203.
 Kasinathan, S., 30.
 Kassner, C., 298.
 Kato, S., 284.
 Kato, T., 250.
 Kawachi, H., 732.
 Kay, H. D., 439.
 Kazarian, Sh. (Kazaryan, S.), 178, 181.
 Kearney, T. H., 31, 34.
 Kearns, C. W., 84.
 Kearns, H. G. H., 233.
 Keck, C. B., 366.
 Keck, W. N., 605.
 Kedzie, F. S., 575.
 Keeler, C. E., 312, 313.
 Keen, B. A., 320.
 Keenan, J. A., 515.
 Keffer, C. A., 144.
 Keil, H. L., 570, 877.
 Keim, F. D., 45, 474.
 Keith, J. I., 375, 524.
 Keith, T. B., 91, 823.
 Keitt, G. W., 432, 489, 625, 631.
 Kelbert, D. G. A., 346.
 Keller, B., 595.
 Kellogg, C. E., 87, 375, 744.
 Kellogg, C. R., 431.
 Kellogg, L. F., 345.
 Kelly, E., 560.
 Kelly, J. P., 755.
 Kelser, R. A., 257.
 Kelso, E. H., 805.
 Kelso, L., 805.
 Kelso, M. M., 403.
 Keltz, R. H., 666.
 Kemmerer, A. R., 560.
 Kemp, H. A., 250.
 Kempster, H. L., 122, 514, 515.
 Kenalty, B. J., 573.
 Kendrick, J. B., 351, 496, 632, 801.
 Kendrick, J. F., 95.
 Kennard, D. C., 241, 521, 671, 828, 829.
 Kennedy, A. H., 539, 804.
 Kennedy, J. R., 408.
 Kent, H. L., 144.
 Keppel, J. J. G., 534.
 Kerkhof, K., 576.
 Kern, F. D., 790.
 Kernkamp, H. C. H., 388.
 Kerr, K. B., 688.
 Kerr, P. J., 249.
 Kertesz, Z. I., 51, 462, 630, 796.
 Kessler, H., 621.
 Kessler, L. H., 700.
 Keur, J. Y., 631.
 Keyes, C. G., 343.
 Kezer, A., 767.
 Khaldina, M., 686.
 Khalifa, I. A. B., 530, 698.
 Khan, A. R., 168.
 Khan, M. H., 227.
 Kidd, F., 421.
 Kidder, R. W., 371.
 Kienholz, R., 344.
 Kiesselbach, T. A., 45.
 Kik, M. C., 739.
 Kilborne, F. L., 289.
 Kildee, H. H., 4.
 Kilduffe, R. A., 837, 838.
 Killham, B. J., 255.
 Killough, D. T., 175, 315.
 Kilpatrick, M., 291.
 Kimball, T. L., 376.
 Kimbrough, W. D., 41, 316, 322, 331.
 Kimmel, L., 889.
 Kimmins, D. E., 232.
 Kimura, G. G., 261.
 Kincaid, R. R., 316.
 Kincer, J. B., 297.
 Kindt, L. E., 861.
 King, A. G., 604.
 King, B. M., 466.
 King, C. B. R., 655.
 King, C. G., 379, 885.
 King, C. J., 794.
 King, C. M., 757, 784, 788.
 King, E. J., 151, 152, 439.
 King, H., 587.
 King, H. E., 320.
 King, M. V., 228.
 King, R. H., 324.
 Kinman, C. F., 338.
 Kinnison, A. F., 483.
 Kirk, L. E., 181, 311, 319.
 Kirkpatrick, E. L., 717.
 Kirkpatrick, R. T., 466.
 Kirsch, W., 516.
 Kise, Y., 416.
 Kitchin, A. W. M., 266.
 Klaas, H. K., 866.
 Klapp, E., 174.
 Kleiber, M., 524.

- Klein, G. T., 143.
 Kleiner, I. S., 294.
 Kline, O. L., 515.
 Klose, A., 521.
 Kloser, M., 248.
 Klotz, L. J., 632.
 Knandel, H. C., 373, 678, 823.
 Knapp, A. W., 888.
 Knapp, H., 736.
 Knapp, J. G., 124.
 Knapp, S. A., 736.
 Knäginichev, M. I., 180.
 Knight, E. Q., 185.
 Knight, N., 159.
 Knight, R. C., 333, 334, 338.
 Knight, S. H., 251.
 Knoblauch, H. C., 306.
 Knopp, C. E., 523.
 Knott, J. C., 242, 243, 523, 524.
 Knott, J. E., 185, 770, 771.
 Knowles, A. S., Jr., 89, 456.
 Knowles, F., 611.
 Knowles, H. R., 515.
 Knowles, N. R., 835.
 Knowlton, G. F., 357, 359, 501, 510, 812.
 Knox, C. W., 87, 680.
 Knox, G. W., Jr., 239.
 Knox, M. A., 267.
 Knudsen, M. H., 33.
 Knull, J. N., 74.
 Knust, H. G., 359.
 Knyaginichev, M. I., 180.
 Kobayashi, K., 805.
 Kobel, F., 618.
 Kobozeff, N., 417.
 Koch, F. C., 756.
 Koch, H., 501.
 Koch, K., 489, 640.
 Koehler, B., 630.
 Koehne, M., 724, 733.
 Koenig, P., 576.
 Koeslag, J. D., 740.
 Kögl, F., 597.
 Köhler, E., 797.
 Köhler, P., 662.
 Kohls, H. L., 471.
 Kohman, E. F., 875, 888.
 Kojima, T., 217.
 Kokolios, B., 644.
 Kolb, J. H., 717.
 Kolpakova, S. A., 838.
 Komarov, A., 697.
 Komarov, V. A., 459.
 Kon, S. K., 685, 833.
 Kondarev (Kondareff), M., 778, 779.
 Kondo, S., 102.
 Konishi, S., 201.
 Konno, T., 250.
 Konsuloff, S., 217.
 Konzo, S., 426.
 Koonce, D., 767.
 Kopeloff, L. M., 834.
 Kopeloff, N., 834.
 Kopland, D. V., 681.
 Köppen, W., 446.
 Korff, G., 639.
 Körting, A., 217.
 Kosterhans, D. G. F. R., 597.
 Kosteškil, N. D., 741.
 Kostoff, D., 168.
 Kovalenko, G. M., 321.
 Kovatcheff, Y. G., 856.
 Kozella, F. L., 559.
 Kozhantschikow, I. W., 217.
 Kramer, B., 443.
 Kramer, M. M., 416, 886.
 Kramer, P. J., 194.
 Kraneveld, F. C., 839, 840.
 Kratz, A. P., 426.
 Krauss, W. E., 376, 523.
 Kraybill, H. R., 25, 61, 88.
 Kreitmair, H., 879.
 Kreuger, T., 55.
 Krishna Ayyar, N., 826.
 Kriss, M., 823.
 Kritschewski, I. L., 102.
 Krüber, O., 510.
 Kroemer, K., 338.
 Kron, I. (S.), 835.
 Krueger, W. C., 115.
 Krug, C. A., 483.
 Krull, W. H., 652.
 Kruse, H. D., 876.
 Krusekopf, H. H., 448.
 Kuehner, C. L., 502.
 Kuhlman, A. F., 559.
 Kuhlman, A. H., 376, 523, 524.
 Kuhn, R., 279, 280.
 Kulkarni, L. G., 601.
 Kumashiro, S., 366.
 Kunitz, M., 582.
 Kunkel, L. O., 432.
 Kuntz, W. A., 347, 358.
 Kuntze, R., 217.
 Kurata, S., 210.
 Kurose, Y., 13.
 Kwai-Shang, C., 665.
 Kyzer, E. D., 315, 758, 823.
 Lacaille, C. W., Jr., 227, 695.
 Lachmund, H. G., 71, 72.
 Ladd, C. E., 4, 143, 144, 145, 894.
 LaFollette, J. R., 362.
 Lafosse, 12.
 Lagassé, F. S., 479.
 Lahey, F. H., 891.
 Laibach, F., 458.
 Laidlaw, H. H., Jr., 431.
 Laird, D. A., 872.
 Lal, K. B., 225.
 Lall, G., 337.
 Lamar, W. L., 111.
 LaMaster, J. P., 243, 524, 831.
 Lamb, H., 631.
 Lambert, E. B., 631.
 Lambert, W. V., 755, 843.
 Lamerson, P. G., 513.
 Lammerts, W. E., 461.
 Landauer, W., 32.
 Landenberg, M. E. L., 839, 840.
 Lander, P. E., 673.
 Landis, P. H., 575.
 Landis, Q., 867.
 Landon, I. K., 430.
 Lane, L. A., 727.
 Lane, R. P., 763.
 Lang, O. W., 389.
 Langdon, L. M., 342.
 Langenbuch, R., 217.
 Langord, L., 489.
 Langston, W. C., 730.
 Lanham, W. B., 321, 854.
 Lanphere, W. M., 803.
 Lantow, J. L., 234.
 Lantz, H. L., 333, 769.
 Large, J. R., Jr., 649.
 Larmour, R. K., 867.
 Larrier, L. N., 836.
 Larsen, C. S., 343.
 Larson, R. H., 489, 494.
 Larter, L. N. H., 755.
 Lash, E., 102.
 Latimer, L. P., 186, 337.
 Latshaw, W. L., 38.
 Lattimer, J. E., 856.
 Latzke, E., 719.
 Lauprecht, E., 601.
 Laurens, H., 742.
 Laurie, A., 47, 486.
 Lauritzen, C. W., 299.
 Lauritzen, J. I., 352, 471.
 Lavis, C. A., 323.
 Lavrevsky, M., 754.
 Law, R. G., 539.
 Lawton, F. L., 734.
 Layton, D. V., 787.
 Lazarevskii (Lazarevsky), M., 754.
 Lea, G. L., 15.
 Leach, J. G., 211, 217, 636.
 Leach, L. D., 632, 641.
 Leake, H. M., 159.
 Lease, E. J., 456.
 Lease, J. G., 560.
 Leasure, E. E., 841, 843.
 Lebedeva, M., 325.
 Leblond, C. P., 421.
 Leclainche, E., 102.
 LeClerg, E. L., 206.
 LeCompte, E. L., 213.
 Lecoq, R., 729.
 Ledebor, M. S. J., 210.
 Leding, A. R., 119.
 Ledingham, G. A., 631.
 Lee, A. M., 104, 257, 333.
 Lee, A. T. M., 855.
 Lee, C. D., 843.
 Lee, C. F., 880.
 Lee, J. R., 266, 855.

- Lee, L. L., 14.
 Lefebvre, C. L., 508, 814.
 Lehman, S. G., 65, 66, 631.
 Leiby, R. W., 75.
 Leick, E., 740.
 Leighton, A., 687.
 Leighty, C. E., 616.
 Leinbach, F. H., 675.
 Leith, B. D., 467.
 Leland, O. M., 144.
 Lemétayer, E., 535.
 Lemos Monteiro, J., 821.
 Lengyel, G., 174.
 Lentz, W. J., 390, 842.
 Leonard, C. D., 451.
 Leonard, E. R., 52, 780.
 Leonard, S. L., 34, 313.
 Leonian, L. H., 637.
 Lepape, A., 589.
 Le Pelley, R. H., 205, 811.
 Lepkovsky, S., 874, 890.
 Lesbouyries, 698.
 Lesley, J. W., 753.
 Lesley, M., 753.
 Leslie, A., 519.
 Lester, R. A., 711.
 Lestoquard, F., 254.
 Le Sueur, A. D. C., 192.
 Leukel, R. W., 200, 470.
 Leukel, W. A., 316, 467.
 Leven, M., 710.
 Levering, S. R., 775, 776.
 Leverton, R. M., 878.
 Levine, M., 117, 499, 631.
 Levine, N. D., 503.
 Levine, P. P., 383.
 Levine, V. E., 583, 587.
 Levinton, Z., 702.
 Leviton, A., 687.
 Levowitz, D., 95.
 Levy, M., 441.
 Lewis, A. B., 118.
 Lewis, E. A., 820.
 Lewis, E. B., 851.
 Lewis, G. N., 48.
 Lewis, H. B., 437.
 Lewis, I. P., 47.
 Lewis, K. G., 848.
 Lewis, M. R., 480, 540.
 Lewis, M. T., 769.
 Lewis, R. C., 419.
 Lewis, R. D., 48, 288.
 Liastchenko, P. I., 854.
 Lichtwitz, L., 891.
 Lichty, L. C., 399.
 Lieberman, D. P., 872.
 Lienhardt, H. F., 843.
 Light, A. B., 570.
 Light, R. F., 97.
 Ligneris, M. J. A. des, 538.
 Lillienfeld, F. A., 754.
 Lilleland, O., 623.
 Lilly, J. H., 502, 509.
 Lima, A. da Costa, 664.
 Liming, O. N., 631.
 Lin, L. T., 323.
 Lincklaen Arriëns, A. L., 789.
 Lincoln, F. C., 72.
 Lindbergh, C. A., 431.
 Lindgren, D. L., 77.
 Lindquist, H. G., 524.
 Lindquist, J. C., 802.
 Lindstrom, E. W., 757, 768, 787.
 Lineberry, R. A., 455.
 Linfield, F. B., 894.
 Linford, M. B., 593.
 Ling, H. W., 566.
 Lininger, F. F., 267, 858.
 Link, K. P., 438, 439, 440, 560, 630.
 Linn, M. B., 788.
 Lins de Almeida, J., 697.
 Linsbauer, K., 593.
 Linton, R. G., 101, 234.
 Lipman, C. B., 48.
 Lipman, J. G., 4, 142, 143.
 List, G. M., 225, 358.
 Little, D. M., 159.
 Little, G. W., 390, 536, 842.
 Lively, C. E., 718.
 Livermore, J. R., 758.
 Livingston, B. E., 594.
 Livingston, L. G., 593.
 Livingstone, E. M., 81.
 Lloyd, E. A., 260.
 Lloyd, J. W., 776.
 Lloyd, W. E., 374.
 Lo, C. S., 530.
 Lobdell, R. N., 327, 358.
 Loeb, L., 464.
 Loehwing, W. F., 593.
 Loftus-Hills, G., 526.
 Lohr, E. W., 111.
 Lombardo, A., 576.
 Lominski, I., 840.
 Löndborg, G., 107.
 Long, A. R., 742.
 Long, H. F., 686.
 Long, J. H., 476.
 Long, M. L., 723.
 Long, W. H., 266.
 Longley, L. E., 783.
 Loofbourow, J. R., 7.
 Loomis, C. P., 273.
 Loomis, W. E., 328, 783.
 Loop, J., 242.
 Loop, J. F., 242.
 López Domínguez, F. A., 286.
 Lord, E., 320.
 Loree, R. E., 482.
 Lorenz, F. W., 172, 829.
 Lornie, W. S., 256.
 Lott, R. V., 189.
 Loucks, K. W., 347.
 Lough, S. A., 437.
 Louis, L., 11.
 Lourens, L. F. D. E., 102.
 Love, H. H., 578, 758, 764.
 Love, J. E., 758.
 Lovell, W. G., 703.
 Lovern, J. A., 281, 564, 565, 584.
 Lovvorn, R. L., 448.
 Lowe, B., 866.
 Lowe, H. J., 529.
 Lowe, J. L., 638.
 Lowenfeld, M. F., 278.
 Lubbehusen, R. E., 108, 259.
 Luck, M. G., 718.
 Lucker, J. T., 214, 695.
 Luckett, J. D., 287.
 Ludwig, C. A., 20.
 Ludwig, D., 664.
 Lugg, J. W. H., 9.
 Lühmann, M., 217.
 Lund, H. O., 669.
 Lundstedt, E., 246.
 Lundstrom, F. O., 165.
 Lunn, W. M., 758, 789.
 Lunt, H. A., 629.
 Lush, J. L., 31, 90, 681, 755.
 Lush, R. H., 96, 97, 315, 376, 523.
 Luthra, J. C., 793.
 Lutman, A. S., 474.
 Lutman, B. F., 65, 306.
 Lutz, J. F., 17, 448.
 Lutz, J. M., 620, 621.
 Lyle, S. P., 701.
 Lyman, J., 216.
 Lynch, K. M., 878.
 Lyne, W. H., 654.
 Lynsky, M., 711.
 Lyon, C. J., 785.
 Lyon, M. W., Jr., 688.
 Lyon, T. L., 758.
 McAlister, E. D., 843.
 MacAloney, H. J., 819.
 McBain, A., 205.
 McBride, O. C., 366, 368.
 McCall, A. G., 144.
 McCall, R., 89.
 McCalla, A. G., 615, 867.
 McCallan, S. E. A., 631.
 McCampbell, S. C., 228.
 McCan, J. C., 524.
 McCapes, A. M., 528.
 McCarter, J., 694, 837.
 McCarthy, E. F., 785.
 McCarty, M. A., 823.
 McCay, C. M., 822, 830.
 McClelland, C. K., 756.
 McClure, F. J., 823.
 McCollum, E. V., 278, 876.
 McCollum, J. P., 50.
 McComb, A. L., 193.
 McConnell, H. S., 507.
 McCord, J. E., 776, 855.
 McCormack, R. B., 630, 788.
 McCormick, A. C., 619.
 McCormick, F. A., 803.
 McCormick, T. C., 864.
 McCosh, S. S., 728.
 McCown, J. D., 331.
 McCown, M., 354.

- McCoy, J. E., 242.
 MacCreary, D., 228.
 MacCreary, O. C., 251.
 McCrory, S. H., 699.
 McCubbin, E. N., 183.
 McCue, C. A., 129.
 McCulloch, R. N., 815.
 McCullough, N. B., 286.
 McCurdy, J. C., 112.
 McDaniel, E. I., 224, 502.
 MacDaniels, L. H., 187, 773.
 MacDonald, G. B., 743, 784, 788.
 McDonald, R. E., 74.
 MacDonald, S. P., 719.
 MacDonald, T. H., 542.
 McDougall, W. A., 231, 359.
 McDougle, H. C., 528.
 McDowall, F. H., 685.
 McDowell, C. H., 176.
 McDunnough, J., 509.
 McEwen, A. D., 837.
 McEwen, G. F., 447.
 McFarlane, W. D., 877.
 McGee, H. A., 758.
 McGeorge, W. T., 299, 452.
 MacGillivray, J. H., 328.
 McGinty, R. A., 331, 431.
 MacGregor, A. D., 249.
 MacGregor, E. A., 219, 364.
 MacGregor, J. J., 266.
 McGuire, L. P., 331.
 Machacek, J. E., 630, 631.
 McIndoo, N. E., 663.
 McIntosh, A., 214.
 McIntosh, G. E., 214.
 McIntosh, R. A., 534.
 McIntyre, A. C., 193, 785.
 McIntyre, C. W., 466.
 Mack, M. J., 525.
 Mack, W. B., 183, 594, 769.
 Mackay, H. M. M., 419.
 Mackay, J., 55.
 McKee, R., 325, 706, 762.
 McKelvey, J. G., 245.
 McKenna, C. T., 534.
 McKenzie, F. F., 463, 465.
 MacKenzie, P. C., 823.
 McKeown, T., 465.
 Mackerras, I. M., 367.
 Mackerras, M. J., 367.
 McKibben, E. G., 850.
 Mackie, D. B., 653, 654.
 Mackie, W. W., 632.
 MacKinney, A. L., 193, 344.
 McKinney, H. H., 325, 614.
 McLaine, L. S., 654.
 McLaughlin, A. M., 356.
 McLaughlin, H., 866.
 McLean, H. C., 52.
 McLendon, C. A., 736.
 MacLeod, G. F., 807.
 MacLeod, J., 820.
 MacLeod, J. J. R., 279.
 McLester, J. S., 278.
 McMichen, B., 670.
 McMillan, J. R. A., 607.
 McMinis, A. S., 880.
 McMunn, R. L., 188, 189.
 McMurtrey, J. E., Jr., 43.
 McNamara, H. C., 493.
 McNamara, K., 192.
 McNeal, W. B., 143.
 McNew, G. L., 787, 788.
 McNutt, S. H., 841.
 McPhail, C. J., 213.
 Macrae, D. R., 393.
 Macrae, T. F., 154.
 McRae, W., 606.
 McVey, F. L., 4, 144.
 MacWalter, R. J., 280, 882.
 McWhorter, C. C., 553.
 McWhorter, O. T., 499, 814.
 Macy, H., 380, 524, 684.
 Macy, I. G., 722, 727, 728, 871.
 Macy, R. W., 392.
 Madden, A., 742.
 Madden, A. H., 448.
 Maddock, E. C. G., 533.
 Maddox, D., 736.
 Mader, E. O., 630, 631, 788.
 Madrid, V. J., 230, 808.
 Madsen, D. E., 382.
 Madwar, S., 663.
 Magistad, O. C., 11, 782.
 Magness, J. R., 619, 775.
 Magoon, C. A., 347.
 Magrou, J., 802.
 Magruder, R., 185.
 Mahajan, M. R., 693.
 Maheux, G., 231.
 Mains, E. B., 793.
 Malensek, S., 107.
 Mallison, E. D., 337.
 Mallmann, W. L., 261.
 Malloch, J. G., 473.
 Malquori, G., 198.
 Maney, T. J., 341, 769.
 Mangels, C. E., 180.
 Mann, C. W., 192.
 Mann, D. W., 159.
 Mann, F. C., 261.
 Mann, G. R., 47, 486.
 Mann, H. B., 304, 455.
 Mann, H. H., 301.
 Mann, W. M., 650.
 Manninger, R., 102, 538.
 Manny, T. B., 557.
 Manresa, M., 313, 839.
 Manson, J. M., 599.
 Mansour, K., 500.
 Mansour-Bek, J. J., 500.
 Manter, J. A., 216.
 Manuel, C. G., 805.
 Manville, I. A., 880.
 Marais, J. S. C., 529.
 Marble, D. R., 240.
 Marchionatto, J. B., 568, 789.
 Marcovitch, S., 78, 345.
 Marcus, B. A., 217.
 Marin, A. G., 199.
 Marlatt, A. L., 560.
 Marlow, A., 877.
 Marlowe, R. H., 358, 366.
 Marples, B. J., 805.
 Marquardt, J. C., 377, 379, 524, 525.
 Marsais, P., 646.
 Marsh, H. E., 228.
 Marshall, C. F., 101.
 Marshall, G. A. K., 811, 818
 Marshall, G. B., 721.
 Marshall, G. E., 82, 216.
 Marshall, H. L., 8.
 Marshall, J., 364.
 Marshall, J. B., 600.
 Martin, D. C., 571.
 Martin, E., 821.
 Martin, H., 67, 68, 505.
 Martin, John H., 462.
 Martin, Jos. H., 240.
 Martin, J. N., 311, 458, 757.
 Martin, J. T., 810.
 Martin, O. B., 143.
 Martin, S., 662.
 Martin, W. H., 60.
 Martinez de Bujanda, E., 857.
 Marts, R. O., 345.
 Maruyama, S., 586.
 Marvin, C. F., 160.
 Marvin, G. E., 502.
 Marx, F. M., 575.
 Masaki, J., 218.
 Mason, A. C., 366, 368, 369.
 Mason, I. C., 625.
 Mason, J. H., 529.
 Mason, T. G., 459.
 Massengale, O. N., 888.
 Massey, L. M., 631.
 Massey, R. E., 320, 351.
 Massey, Z. A., 372.
 Master, J. P. La, 524.
 Masure, M. P., 619.
 Mata, C. G., 740.
 Mather, K., 470.
 Mather, W. G., Jr., 129.
 Matheson, R., 807.
 Mathews, S., 870.
 Mathiesen, H. A., 242.
 Mathis, W. T., 130.
 Mathur, R. N., 658.
 Matsumura, T., 250.
 Matsuura, H., 309.
 Matthews, C. A., 95.
 Matthews, E. D., 14.
 Matthews, W. A., 183.
 Mattick, A. T. R., 155, 527.
 Mattill, H. A., 879.
 Mattoon, W. R., 847.
 Mattson, S., 288, 450, 745.
 Mauer, J. C., 377.
 Maule, W. L., 194.
 Maurer, W., 465.
 Maw, A. J. G., 238.
 Maw, W. A., 820.
 May, C., 70.
 May, J. T., 486.

- Mayerson, H. S., 742.
 Mayhew, R. L., 536, 843.
 Maynard, E. A., 805.
 Maynard, E. J., 371, 827.
 Maynard, L. A., 377, 822, 823, 830.
 Mayton, E. L., 760.
 Mebane, W. M., 572.
 Medlar, E. M., 384.
 Medvedeva, G. B., 749.
 Mee, A. J., 870.
 Megee, C. R., 666.
 Mehl, P., 716.
 Mehlich, A., 448, 745.
 Mehrling, A. L., 21.
 Mehrlich, F. P., 632, 633, 636.
 Meier, F. C., 431, 432, 631.
 Meigs, E. B., 95, 523.
 Mejia, R., 642.
 Melampy, R. M., 822.
 Melchers, L. E., 609, 793.
 Meldrum, H. R., 743, 854.
 Meleney, H. E., 815.
 Melhus, I. E., 788.
 Melicchia, A., 160.
 Melis, A., 658.
 Mellanby, K., 500.
 Melnikov, A., 325.
 Melvin, R., 663.
 Mendel, L. B., 419.
 Mendenhall, D. R., 560.
 Menkin, M. F., 885.
 Menkin, V., 885.
 Mensing, C. C., 304.
 Menzel, C. A., 397.
 Menzies-Kitchin, A. W., 266.
 Mereness, E. H., 862.
 Merkle, F. G., 395, 454.
 Merriam, O., 134.
 Merrill, M. H., 695.
 Merrill, R. M., 705.
 Mervine, E. M., 323.
 Metcalf, Z. P., 659.
 Metivier, H. V. M., 382.
 Metzger, C. H., 177.
 Metzger, F. W., 81.
 Metzger, H. J., 106, 895.
 Metzger, J. E., 13.
 Meyer, A., 285.
 Meyer, A. F., 892.
 Meyer, A. H., 287.
 Meyer, B. S., 593.
 Meyer, C. R., 882.
 Meyer, E., 217.
 Meyer, H. U., 508.
 Meyer, K. F., 842.
 Meyer, N. F., 217.
 Michelbacher, A. E., 368, 512.
 Michurin, I. V., 773.
 Micke, H. W., 261.
 Middleton, A. D., 804.
 Middleton, H. E., 449.
 Middleton, T. H., 579.
 Midgley, A. R., 15, 23, 24.
 Miers, H. A., 810.
 Milby, T. T., 92.
 Miles, C. S., 684.
 Miles, H., 707.
 Miles, H. C. C., 216.
 Miles, L. E., 345, 346, 799.
 Miles, S. R., 756.
 Millar, C. E., 161, 288.
 Miller, C. D., 132, 277.
 Miller, D., 12.
 Miller, E. C., 631.
 Miller, E. R., 331.
 Miller, F. W., 33.
 Miller, G. S., Jr., 650.
 Miller, H., 114.
 Miller, H. G., 36.
 Miller, H. T., 304.
 Miller, J. C., 49, 316, 331, 771.
 Miller, J. I., 822.
 Miller, L. J., 718.
 Miller, M. F., 448.
 Miller, M. W., 239.
 Miller, N. C. E., 657, 817.
 Miller, P. L., 854.
 Miller, P. R., 346.
 Miller, R. C., 546, 823.
 Miller, R. L., 220.
 Miller, R. S., 243.
 Miller, T. A. H., 87.
 Miller, W. B., 349.
 Miller, W. D., 487.
 Miller, W. T., 386.
 Millikan, C. R., 349.
 Mills, H. B., 360.
 Mills, P. J., 766.
 Mills, R. H., 387.
 Mills, W. D., 788.
 Milstead, E. H., 41.
 Milton, W. E. J., 45.
 Milzer, A., 670.
 Minett, F. C., 833.
 Minning, W., 670.
 Misner, E. G., 855.
 Mitchell, C. L., 742.
 Mitchell, H. D., 404.
 Mitchell, H. H., 874.
 Mitchell, H. S., 575.
 Mitchell, J. A., 488.
 Mitchell, J. H., 315, 758, 831.
 Mitchell, J. W., 48.
 Mitra, S. K., 169.
 Mitten, J. W., 376.
 Moffett, A. A., 753, 754.
 Moffett, H. C., 514.
 Mohler, J. R., 249.
 Mohler, W. M., 385.
 Mohs, K., 36.
 Moles, H. S., 49.
 Molliard, M., 597.
 Momma, K., 103.
 Monier-Williams, G. W., 659.
 Mönning, H. O., 528.
 Monroe, C. F., 96, 523.
 Monroe, M. M., 425, 574.
 Monteiro, J. L., 821.
 Monteith, J., Jr., 631.
 Montgomerie, R. F., 106.
 Montlaur, L., 159.
 Mooers, C. A., 315, 469.
 Moon, H. H., 621.
 Moore, G. C., 758.
 Moore, H. F., 112.
 Moore, H. R., 404.
 Moore, J. G., 477.
 Moore, J. H., 321.
 Moore, J. M., 239, 521.
 Moore, L. A., 239.
 Moore, M. B., 489.
 Moore, R. A., 576.
 Moore, R. K., 547.
 Moore, T., 152, 685.
 Moore, W., 363.
 Moore, W. D., 758, 789.
 Morcos, Z., 845.
 Moreland, C. F., 307.
 Morell, S., 438, 439, 440.
 Moreno, E. J., 530.
 Morgan, A. F., 889.
 Morgan, B. G. E., 566.
 Morgan, C. L., 823.
 Morgan, M. F., 429.
 Morgan, O. M., 573.
 Morgan, T. H., 31.
 Morgan, W. R., 265.
 Morison, F. L., 547.
 Moritz, O., 793.
 Morland, D., 819.
 Morrill, A. W., Jr., 81.
 Morris, G. P., 180.
 Morris, H. M., 655.
 Morris, L., 371.
 Morris, M. L., 390, 843.
 Morris, S., 526.
 Morris, T. N., 414, 421.
 Morrison, B. Y., 616.
 Morrison, F. B., 523, 822, 823, 830.
 Morrison, G., 328.
 Morrison, S., 891.
 Morrow, E. B., 316.
 Morse, W. J., 132.
 Mortensen, E., 183.
 Mortensen, M., 830.
 Mortimer, G. B., 449, 466, 501.
 Morton, G. E., 674, 675.
 Morton, R. A., 564, 584.
 Mosenthal, H. O., 891.
 Moser, A. M., 870.
 Moses, B. D., 400.
 Mosley, H. S., 535.
 Mosseray, R., 460.
 Mossman, R. C., 160.
 Mote, D. C., 72, 74, 654.
 Moulton, H. G., 710.
 Mount, M. M., 144.
 Mouriquand, G., 423, 883.
 Moursund, W. H., 250.
 Moutia, A., 655, 656.
 Mowry, H., 327.

- Moxon, A. L., 294, 575.
 Moznette, G. F., 507, 812.
 Mrak, E., 623.
 Muehlbeier, J., 125.
 Mueller, W. S., 381, 525, 527.
 Muir, F. A. G., 816.
 Muir, G. W., 517.
 Mukerji, D., 359.
 Mukerji, J. N., 606.
 Mulhearn, C. R., 229.
 Mulhern, T. D., 229.
 Müller, A. S., 355.
 Muller, G. L., 881.
 Muller, H. J., 484.
 Mumford, F. B., 4, 147, 547.
 Mumford, H. W., 143, 144.
 Munger, F., 74, 80, 508.
 Mungomery, R. W., 359.
 Munir, A., 180.
 Munro, J. A., 666, 895.
 Munsell, H. E., 138, 730.
 Munson, P. L., 314.
 Muratova, V. S., 37.
 Murer, H. K., 523, 524.
 Murnane, D., 103, 106, 529.
 Murneek, A. E., 456, 476, 619, 749, 776.
 Murphy, D. P., 605.
 Murphy, E. A., 584, 874, 890.
 Murphy, H. C., 757, 787.
 Murphy, M. M., Jr., 779.
 Murphy, R. R., 373.
 Murphy, W. P., 892.
 Murray, C., 843.
 Murray, G. N., 235.
 Murray, K. A. H., 266, 855.
 Murray, R. B. H., 255.
 Murray, W. G., 846, 854, 862.
 Musbach, F. L., 449, 778.
 Muse, M., 140.
 Musgrave, G. W., 847.
 Mussehl, F. E., 94.
 Musser, A. M., 769.
 Musser, H. B., 764.
 Musso, J. O., 576.
 Muth, O. H., 73.
 Myer, C. R., Jr., 376.
 Myers, C. H., 756, 770.
 Myers, J. G., 369, 502, 510.
 Nagel, C. M., 636.
 Nagel, R. H., 665.
 Nagel, W. O., 110.
 Nagler, F. A., 110.
 Nagy, R., 560.
 Nahm, L. J., 465.
 Nakagawa, I., 721.
 Nakahara, W., 284, 569.
 Nakamura, N., 102.
 Nakayama, S., 217, 218.
 Nanji, H. R., 152.
 Narasimhan, M. J., 355.
 Natelson, S., 443.
 Nattan-Larrier, L., 836.
 Naumova, N. A., 638.
 Neal, D. C., 345, 349, 493, 631.
 Neal, J. H., 393.
 Neal, N. P., 467.
 Neal, W. M., 370, 375, 376, 523.
 Neale, M. G., 144.
 Neale, P. E., 90.
 Nebel, B. R., 462.
 Nebel, M. L. R., 631, 639.
 Nedeltcheff, N., 779.
 Nedelchev, N., 779.
 Neethling, H. L., 832.
 Negruí, A. M., 754.
 Neilson, J. A., 895.
 Neller, J. R., 298, 347.
 Nelson, A. L., 55.
 Nelson, B. O., 829.
 Nelson, E. M., 137.
 Nelson, F. E., 524.
 Nelson, J. A., 242, 524.
 Nelson, J. B., 107.
 Nelson, J. R., 73.
 Nelson, M., 756.
 Nelson, P., 401, 707.
 Nelson, P. M., 769, 822, 866.
 Nelson, R., 631.
 Nelson, R. M., 55, 665.
 Nelson, T. C., 73, 229.
 Nelson, V. E., 570, 689, 866, 877.
 Nerdahl, N. O., 895.
 Nettles, W. C., 80, 501.
 Neu, L., 107.
 Neuwirth, F., 206.
 Nevens, W. B., 559.
 Newcomer, E. J., 814.
 Newell, W., 429.
 Newhall, A. G., 788.
 Newman, L. J., 656, 663, 667.
 Newman, P. E., 515, 523, 526.
 Newsom, I. E., 537.
 Newton, J. H., 358.
 Newton, M., 631.
 Newton, R., 473.
 Newton, R. G., 797.
 Nichols, F. F., 14.
 Nicholas, J. E., 249, 769, 823, 846.
 Nicholas, J. S., 464.
 Nicholls, H. M., 509.
 Nicholls, W. D., 129, 556.
 Nichols, M. L., 315.
 Nichols, P. F., 430, 868.
 Nicholson, H. H., 539.
 Nicholson, T. F., 157, 724.
 Nicol, H., 468, 609.
 Nicolaidis, C., 173, 240.
 Nienhuis, A. L., 157.
 Nieschulz, O., 217, 529.
 Nieves, R., 61.
 Nightingale, G. T., 47, 48.
 Nishimura, T., 304.
 Niswonger, H. R., 316.
 Nixon, E. L., 788.
 Nixon, R. W., 54.
 Noble, I. T., 866.
 Nogi, K., 585.
 Nojima, T., 211.
 Nolan, O. L., 130.
 Nolan, W. J., 84.
 Noland, T. W., 109.
 Nolen, R. E., 346.
 Noll, C. F., 743, 831.
 Nolla, J. A. B., 752.
 Nordberg, M. L., 574.
 Nordby, J. E., 463, 602.
 Norman, D. B., 234.
 Norris, E. B., 144.
 Norris, L. C., 823.
 Norris, P. K., 408, 552.
 North, G. C., 526.
 North, H. F. A., 317, 610.
 North, M. O., 374.
 Northrop, J. H., 582.
 Norton, J. B. S., 630, 631.
 Nourse, E. G., 710, 853.
 Nowak, 840.
 Nuckols, S. B., 323.
 Nutt, J. D., 266.
 O'Brien, C. S., 727.
 Ocfemia, G. O., 789.
 Ochi, T., 416.
 Odell, T. T., 807.
 Odland, T. E., 184, 306, 317, 610.
 Oehler, E., 752.
 Oehlke, H., 575.
 Oertel, E., 513, 666.
 Ogden, W. B., 467.
 Ogloblin, A. A., 818.
 Ohdake, S., 154.
 O'Kane, W. C., 504, 634.
 O'Kelly, A. A., 572.
 Okey, R., 718.
 Olafson, P., 106, 823.
 Olcott, M. T., 551.
 Olgivie, J. W., 415.
 Olitsky, P. K., 535.
 Oliveros, S. B., 868.
 Olney, J. F., 843.
 Olsen, M. W., 680.
 Olson, C., Jr., 838.
 Olson, H. C., 683.
 O'Neal, E., 895.
 O'Neal, E. A., 4.
 Ong, E. R., de, 513.
 Onuma, F., 195.
 Ookuma, Y., 13.
 Oomori, H., 13.
 Orent, E. R., 876.
 Orr, A. A., 707.
 Orr, J. B., 881.
 Orr, J. H., 383.
 Orr, L. W., 211.
 Ortlepp, R. J., 529.
 Orton, C. R., 631, 896.

- Orwin, C. S., 266.
 Osburn, M. R., 81.
 Osenbrug, A., 759, 770, 826,
 827, 831, 894.
 Oserkowsky, J., 349.
 Oskamp, J., 15, 477, 744,
 773.
 Osland, H. B., 674.
 Ostanin, S., 325.
 Osterberger, B. A., 80, 84.
 Ostertag, R. von, 101.
 Otero, J. I., 490.
 Ott, G. E., 529.
 Ott, L. O., 243.
 Otting, H. E., 523.
 Overholser, E. L., 52, 186,
 188, 334, 777.
 Overley, F. L., 52, 186, 188,
 334.
 Overpeck, J. C., 408.
 Ozer, D. T., 105.
 Oyler, M., 129.
 Packchanian, A., 531.
 Paden, W. R., 315, 744, 758.
 Pagden, H. T., 820.
 Pagluica, S., 159.
 Pagnini, U., 690.
 Paillot, A., 665.
 Painter, W. E., 525.
 Pal, B. P., 767.
 Palm, C. E., 807.
 Palmer, L. A., 396, 702.
 Palmer, L. O., 593.
 Palmer, L. S., 88.
 Palmer, M. A., 659.
 Palmer, R. C., 339.
 Palmer, V. E., 391.
 Palmer, W. W., 891.
 Palo, M. A., 212.
 Panomarewa, I. W., 102.
 Panshin, A. J., 57.
 Pantanelli, E., 12.
 Pape, H., 792, 803.
 Parbery, N. H., 748.
 Parfitt, E. H., 376, 524.
 Parija, P., 181.
 Parish, H. E., 224.
 Parisot, J., 664.
 Park, J. W., 121, 411.
 Park, O. W., 739, 806.
 Parker, C. V., 714.
 Parker, E. R., 191.
 Parker, J. B., 523.
 Parker, J. H., 288.
 Parker, K. G., 646.
 Parker, M. M., 182.
 Parker, N. J., 384.
 Parker, R. L., 513.
 Parker, W. B., 360.
 Parks, R. R., 539.
 Parks, T. H., 218.
 Parnell, I. W., 251, 696.
 Parrott, P. J., 218, 665.
 Parshall, C. J., 386.
 Parsons, D. A., 396, 702.
 Parsons, F. S., 320, 365.
 Parsons, H. T., 560, 879.
 Parthasarathi, N., 461.
 Pasko, D. G., 807.
 Passelaigue, P., 422.
 Passmore, S. F., 601.
 Pátek, K., 43.
 Paterson, A. W., 627.
 Paterson, W. G. R., 675.
 Patmore, J. I., 133.
 Paton, R. F., 113.
 Patrick, C. S., 758.
 Patterson, F. D., 843.
 Patton, C. A., 742.
 Patton, H., 236.
 Patton, W. S., 815, 816.
 Paul, B. H., 55, 345.
 Paul, H., 824.
 Paulie, E. E., 453.
 Paulsen, E. F., 308.
 Paulson, W. E., 554.
 Paustian, R. G., 850.
 Pavlova, N. M., 778.
 Pavlovsky, G., 856.
 Paxton, P. J., 118.
 Payne, L. F., 171.
 Pázler, J., 43.
 Pearce, G. W., 617.
 Pearl, R., 330.
 Pearson, E. O., 320, 362.
 Pearson, H., 710.
 Pearson, O. H., 770.
 Pearson, T., 573.
 Peck, M., 854.
 Peden, O. D., 415.
 Pedersen, H. O., 532.
 Peek, G. N., 2.
 Peet, L. J., 894.
 Peirce, A. S., 356.
 Peirce, F. T., 320.
 Pelc, H., 569.
 Pellett, F. C., 654.
 Pelley, R. H. Le, 205, 811.
 Peltier, G. L., 638.
 Pemberton, C. E., 357.
 Pentzer, W. T., 52, 188, 626,
 773.
 Pepper, H. C., 558.
 Percival, W. C., 649.
 Perkin, H. J., 157.
 Perkins, A. E., 524.
 Perla, D., 389.
 Perold, I. S., 747.
 Perrin, L., 285.
 Persing, C. O., 508.
 Person, L. H., 631.
 Persons, T. D., 345, 346.
 Pescott, R. T. M., 222, 227,
 513, 661.
 Pessar, H. T., 571.
 Pessin, L. J., 598, 786.
 Péter, S. (Peter, A.), 835.
 Peterhänsel, H., 166.
 Peters, J. L., 356.
 Peters, J. P., 891.
 Peters, R. A., 562, 874.
 Petersen, N. F., 45.
 Petersen, W. E., 523.
 Peterson, A., 215.
 Peterson, A. G., 118, 860.
 Peterson, G. M., 412.
 Peterson, W., 143.
 Peterson, W. H., 436, 448,
 459, 489.
 Petit, A., 62.
 Peto, F. H., 612.
 Petri, L., 457.
 Petrie, A. H. K., 594.
 Petrie, G. F., 689.
 Pettet, Z. R., 552.
 Pettigrove, H. R., 175.
 Pettinger, N. A., 303.
 Pettit, J. H., 236.
 Peyerimhoff, P. de, 218.
 Pfau, K. O., 98.
 Phagan, C. V., 117.
 Philip, C. B., 689.
 Phillips, C. J., 574.
 Phillips, E. F., 807.
 Phillips, J. S., 84.
 Phillips, P. H., 378, 515,
 523, 824.
 Phillips, R. W., 463.
 Phillips, V. W., 515.
 Phillis, E., 459.
 Philp, G. L., 666.
 Pickett, B. S., 341, 482,
 769.
 Pickett, T. A., 38, 779.
 Pickett, W. F., 335.
 Pierce, L. T., 742.
 Pierce, W. H., 63, 489.
 Piercy, S. E., 387.
 Pierson, A. H., 57.
 Pierstorff, A. L., 631.
 Pieters, A. J., 762.
 Pinckard, J. A., 489.
 Pincus, G., 314.
 Pincus, J. W., 275.
 Pirie, N. W., 151.
 Pirone, P. P., 631.
 Pistor, W. J., 143.
 Pi-Suñer Bayo, J., 720, 870.
 Pittman, D. W., 316.
 Plagge, H. H., 620, 769.
 Plakidas, A. G., 68, 69, 346.
 Plank, H. K., 654.
 Plastring, W. N., 256.
 Platenius, H., 49, 51, 770.
 Plath, C. H., 575.
 Plath, O. E., 369.
 Platt, B. S., 155.
 Platt, C. S., 521.
 Pledge, H. T., 400.
 Pllice, M. J., 300.
 Plotz, H., 537.
 Plum, M., 524, 681.
 Podzimková, M., 569.
 Poel, J. van der, 207.
 Poesch, G. H., 47.
 Pokrovskaja (Pokrovskaya),
 M., 692.
 Polak, A., 570.
 Polejaeff, W., 812.

- Pollard, A., 581.
 Pollock, R. C., 89.
 Pomeroy, C. S., 342.
 Pond, G. A., 713, 854.
 Poole, C. F., 773.
 Poole, R. F., 352, 598, 631.
 Poos, F. W., 431.
 Pope, O. A., 756.
 Pope, W. T., 182, 191.
 Popp, H. W., 593, 769.
 Porte, W. S., 644.
 Porter, D. R., 773.
 Porter, R. H., 784, 788.
 Pospelov, V. P., 361.
 Post, K., 782.
 Potter, G. F., 336.
 Poulter, T. C., 742.
 Poulton, W. F., 382.
 Powell, C. L., 337.
 Powers, A. J., 376.
 Powers, LeR., 472.
 Powers, W. L., 24, 301.
 Pramanik, B. N., 29, 30.
 Prát, S., 593.
 Pratt, A. D., 315.
 Pratt, G. E., 137.
 Preble, E. A., 356.
 Pressley, E. H., 763.
 Preston, N. C., 800.
 Price, C., 323.
 Price, E. W., 214.
 Price, F. E., 241.
 Price, H. B., 711.
 Price, W. C., 497.
 Price, W. V., 526.
 Prickett, C. O., 884.
 Prickitt, H. N., 229.
 Pridham, A. M. S., 782.
 Priesner, H., 659, 812.
 Priestley, F. W., 382.
 Prince, A. L., 21, 23.
 Prince, J. B., 803.
 Procter, R. C., 86, 515, 823.
 Proebsting, E. L., 190, 338.
 Prosoroff, S. S., 217.
 Prouty, C. C., 241, 242, 243.
 Provan, A. L., 317.
 Prucha, M. J., 525.
 Prutzkova, M., 325.
 Pruzhanskaja, E. M. (Pružanskaja), E., 597.
 Pugh, A. J., 162, 450.
 Pullar, E. M., 261.
 Pulovkina, Z. M., 321.
 Purdy, W. G., 327.
 Purr, A., 586.
 Purves, C. M., 853.
 Putnam, H. W., 867.
 Putnam, P., 662.
 Putterill, V. A., 782.
 Py, H., 597.
 Pyke, E. E., 780.
 Quanjer, H. M., 631.
 Quastel, J. H., 153.
 Quayle, H. J., 225, 226, 358, 363.
 Querci, O., 507.
 Queuille, S., 883.
 Quilligan, J. J., 523.
 Quinby, J. R., 42, 470.
 Quinn, J. P., 91.
 Rabinovich, I. E., 177.
 Race, J., 11.
 Rachad, A. M., 102, 537.
 Rademacher, B., 792.
 Rader, D. S., 593.
 Rae, J. J., 439.
 Raevskii, V. V. (Raevsky, W.), 691.
 Ragsdale, A. C., 95, 466, 515, 525.
 Rainwater, C. F., 75, 807.
 Raleigh, W. P., 631.
 Ralli, E. P., 563.
 Ram, G., 227.
 Ram, K., 611.
 Ramakrishna Ayyar, T. V., 359, 655.
 Ramanujam, S., 461.
 Ram Ayyar, C. S., 455.
 Ramdas, L. A., 12, 297.
 Ramiah, K., 461, 765.
 Ramon, G., 535.
 Ramser, C. E., 111, 700.
 Ramsey, R. J., 524, 687.
 Rancken, G., 168.
 Randall, S. S., 437.
 Randoine, L., 883, 884, 887.
 Randolph, H., 359.
 Rands, R. D., 63, 349.
 Rankin, W. H., 304, 624.
 Ranney, A. F., 384.
 Ranney, W. P., 854.
 Rao, G. G., 163.
 Rao, M. G. V., 803.
 Rapport, V. A., 127.
 Rasmussen, E. J., 187, 337.
 Ratchevski, F., 418.
 Ratcliffe, H. E., 895.
 Rather, H. C., 762.
 Ratliffe, G. T., 794.
 Ravikovitch, S., 162, 451.
 Rawlins, T. E., 632, 633, 643, 646.
 Rawson, G. W., 530.
 Ray, C. L., 741.
 Ray, G. S., 716.
 Ray, S. N., 568, 586, 731.
 Readhimer, D., 733.
 Record, P. R., 671, 672, 828, 829.
 Records, E., 697.
 Reddy, C. S., 757, 787, 788.
 Redemann, C. E., 437.
 Reed, A. H., 265.
 Reed, F. D., 546.
 Reed, G. B., 383.
 Reed, G. M., 62.
 Reed, H. E., 121.
 Reed, H. J., 35, 141.
 Reed, J. F., 431.
 Reed, M. V., 155.
 Reed, O. E., 525.
 Reed, R. L., 627.
 Reed, W. D., 81.
 Reed, W. W., 742.
 Rees, C. W., 385.
 Rees, D. M., 806.
 Regan, W. M., 524.
 Regli, P. E., 595.
 Reich, K., 453.
 Reichert, F., 308.
 Reid, D. A. G., 396.
 Reid, M. G., 557.
 Reid, W. H. E., 101, 247, 248, 525.
 Reid, W. J., Jr., 807.
 Reidy, J. B., 257.
 Reiffenberg, A., 16.
 Reineke, L. H., 786.
 Reinhard, H. J., 663, 815.
 Reinking, O. A., 489.
 Reinmuth, E., 801.
 Reitz, T. R., 430.
 Remington, R. E., 878.
 Remlinger, P., 536.
 Remmert, W. H., 464.
 Remsburg, R., 630.
 Rendle, A. B., 460.
 Reneger, C. A., 14.
 Renne, R. R., 856.
 Rényi, G. S. De, 605.
 Revzan, D. A., 856.
 Reyes, N. C., 839.
 Reynolds, E. B., 175, 315.
 Reynolds, R. V., 57.
 Reznikoff, P., 724, 725.
 Rhoades, M. M., 758.
 Rhoads, A. S., 346, 355.
 Riasanzew, A. W., 751.
 Rižantsev, A. V., 751.
 Rice, C. E., 383.
 Rice, F. O., 703.
 Rice, J. E., 846.
 Rice, M. A., 638.
 Rice, T. D., 252.
 Rice, V. A., 244, 311.
 Richards, A. E., 714.
 Richards, B. L., 347, 350.
 Richards, E. H., 748.
 Richards, H. I., 407.
 Richards, L. A., 25.
 Richards, M. B., 881.
 Richardson, C. H., 503, 654, 656, 806.
 Richardson, G. A., 524.
 Richardson, G. M., 151.
 Richardson, H. H., 223.
 Richardson, L. R., 564.
 Richey, F. D., 144, 288.
 Richman, E., 583.
 Richmond, E. A., 357.
 Richmond, R. G., 358, 666.
 Richter, O., 892.
 Riddet, W., 685.
 Ries, R. W., 515.
 Rigor, T. V., 679.
 Riker, A. J., 489, 631.
 Riker, R. S., 489, 631.

- Riley, E., 270, 855.
 Riley, J. A., 758.
 Riley, O. N., 47.
 Rimington, C., 529.
 Rinehart, E. F., 825.
 Ringrose, A. T., 823.
 Ringrose, R. C., 823.
 Rinjard, P., 102, 839.
 Ripley, L. B., 664, 809.
 Richter, P. O., 501.
 Ritchey, G. E., 316, 371.
 Ritchie, J., 367.
 Ritchie, W. S., 515, 522, 892.
 Rivas, E. C., 654.
 Roach, W., 537.
 Roach, W. A., 332.
 Roadhouse, C. L., 377, 524.
 Roark, R. C., 502, 504, 808.
 Robb, A. D., 740, 742.
 Robbins, R. C., 132, 277.
 Robbins, W. R., 35, 47.
 Roberts, J. I., 386.
 Roberts, J. W., 187.
 Roberts, O. S., 25.
 Roberts, P. H., 448.
 Roberts, R. A., 216.
 Roberts, R. E., 237.
 Roberts, R. H., 489, 625.
 Robertson, C. L., 447.
 Robertson, D. W., 767.
 Robertson, E. I., 92.
 Robertson, P. D., 868.
 Robertson, R. E., 298.
 Robey, O. E., 539.
 Robinson, B. B., 39.
 Robinson, C. W., 242, 243.
 Robinson, D. H., 468.
 Robinson, J. L., 757, 822.
 Robinson, J. W., 255.
 Robinson, R. H., 52.
 Robinson, T. R., 781.
 Robinson, W. D., 873.
 Robotka, F., 555.
 Robson, H. R., 113.
 Roche, B. H., 515, 523, 526.
 Rochlin, E., 495.
 Rodenhiser, H. A., 195, 631.
 Roderick, L. M., 388.
 Roe, J. H., 585.
 Roe, R. J., 529.
 Roebuck, A., 808.
 Roedel, H. Van, 537, 538.
 Rogers, C. H., 167.
 Rogers, L. J., 399.
 Rogers, W. B., 315, 758.
 Rogers, W. S., 334.
 Rohmer, P., 283, 422.
 Rohrbaugh, P. W., 363.
 Rokhlina, E. J., 495.
 Rolf, A. F., 679, 828.
 Rolfe, S. W., 506.
 Romanoff, A. L., 173, 651, 679, 823.
 Romell, L. G., 164.
 Ronna, A., 576.
 Roos, A. J., 424.
 Rosahn, P. D., 171, 465.
 Roscoe, M. H., 566, 567, 585.
 Roscoe, M. V., 169.
 Rose, D. H., 620.
 Rosell, J. M., 105, 250, 693.
 Rosella, E., 644.
 Rosen, H. R., 209, 346, 498, 787.
 Rosenbusch, F., 842.
 Rosenfeld, E. F., 690.
 Rosenheim, O., 587.
 Rosenthal, E., 739.
 Roseveare, G. M., 174.
 Ross, H. E., 830.
 Ross, I. C., 382.
 Ross, P. H., 144.
 Ross, V., 390.
 Ross, W. F., 444.
 Rossi, G., 566.
 Rossi, U., 614.
 Roth, W. J., 861.
 Rothgeb, R. G., 37.
 Rothrock, A. M., 263.
 Rottensten, R. V., 830.
 Roudabush, R. L., 664.
 Roundy, Z. D., 526.
 Rouse, A. H., 796.
 Rouse, W. L., 556.
 Row, G. R., 342.
 Row, S. B., 706.
 Rowlands, W. T., 106.
 Roy, G. T., 855.
 Rozenfeld, E. F., 690.
 Rubtzov, I. A., 361.
 Rudall, K. M., 518.
 Rudge, E. A., 649.
 Rudloff, C. F., 53.
 Rudolfs, W., 110, 117.
 Rudorf, G., 456.
 Rudorf, W., 771.
 Ruehe, H. A., 682, 687.
 Ruehle, G. D., 347, 499.
 Ruggles, A. G., 73.
 Runnels, H. A., 197, 198, 632, 790.
 Rupel, I. W., 380, 466, 515, 523, 526.
 Ruprecht, R. W., 298, 485.
 Rusanov, F. N., 598.
 Rush, D. R., 410.
 Russell, E. J., 819.
 Russell, P. F., 220, 814.
 Russell, R. D., 159.
 Russell, R. J., 159.
 Russell, W. C., 88, 245, 561.
 Ruston, A. G., 266.
 Ruston, D. F., 266.
 Ruttle-Nebel, M. L., 631, 639.
 Ruttner, F., 576.
 Růžicka, A., 43.
 Ryerson, K., 144.
 Ryerson, K. A., 627.
 Rygh, O., 887.
 Ryker, T. C., 489.
 Sacay, F. M., 275.
 Sachs, W. H., 315.
 Sackett, R. L., 143.
 Sackville, J. P., 673.
 Sacrez, R., 422.
 Sager, G. V., 159.
 Sah, P. P. T., 564.
 Sahashi, Y., 282, 569.
 Sahasrabuddhe, D. L., 591.
 Saijo, M., 249, 250.
 St. Clair, G. P., 395.
 St. George, R. A., 344.
 St. John, J. L., 92, 188.
 St. John, R. R., 175.
 St. Pierre, M., 822.
 Sakimura, K., 658.
 Salaman, R. N., 205.
 Salisbury, G. W., 523, 830.
 Salman, K. A., 808.
 Salmon, E. S., 63, 67, 68.
 Salmon, W. D., 828.
 Salter, R. M., 288.
 Samisch, Z., 889.
 Samoilo, A. E., 177.
 Sampson, J., 692.
 Samtsevich (Samtzevich), S. A., 687.
 Samuel, G., 350.
 Samuel, L. W., 445, 581.
 Sanborn, C. E., 818.
 Sanborn, N. H., 888.
 Sanders, D. A., 385, 695.
 Sanders, G. E., 631.
 Sanders, G. P., 686.
 Sanders, J. T., 707.
 Sanders, U., 283.
 Sanderson, D., 3, 129, 146, 717.
 Sando, W. J., 325, 614.
 Sandstedt, R. M., 867.
 Sandsten, E. P., 894.
 Sansum, W. D., 723.
 Santo, V. dos, 576.
 Santos, D. S., 868.
 Sapper, K., 446.
 Sasaki, K., 98.
 Sass, J. E., 170.
 Sastri, B. N., 582.
 Sater, L. E., 894.
 Sater, V. E., 425.
 Sattar, A., 200, 793.
 Saudek, E. C., 448.
 Säulescu, N., 319.
 Savage, D. A., 468.
 Savage, E. S., 524, 830.
 Savare, J., 729, 730.
 Sawada, E., 481.
 Sawin, P. B., 602.
 Sax, K., 311.
 Saxe, A. H., 109.
 Sayer, W., 606, 851.
 Sayre, C. B., 617.
 Saywell, L. G., 868.
 Sazama, R. F., 216.
 Scarseth, G. D., 315.
 Schaal, L. A., 64.
 Schaffner, J. H., 30, 576.

- Schaffner, J. V., Jr., 228.
 Schaffnit, E., 595.
 Schaible, P. J., 239.
 Schalk, A. F., 575.
 Schalm, O. W., 259.
 Schanderl, H., 338.
 Scharr, L. R., 526.
 Schaub, I. O., 144.
 Schedl, K., 217, 227.
 Schedl, K. E., 217.
 Scheffer, T. H., 213.
 Scheinkin, D., 359, 660.
 Schermerhorn, L. G., 35, 47.
 Schickele, R., 121.
 Schloss, O. M., 891.
 Schlotthauer, C. F., 261.
 Schlumberger, O., 797.
 Schmeckebier, L. F., 429.
 Schmidt, C. L. A., 291.
 Schmidt, E. H., 14.
 Schmidt, J., 601.
 Schmidt, M. M., 876.
 Schmidt, R., 316.
 Schmidt, W., 576, 588.
 Schmitt, C. G., 488.
 Schmitt, J. B., 75.
 Schneider, B. H., 873.
 Schneider, J. B., 405, 410.
 Schnur, G. L., 629.
 Schoening, H. W., 252.
 Schofield, R. K., 581.
 Scholl, E. E., 818.
 Scholl, J. C., 159.
 Schollander, E. G., 575.
 Scholtz, A., 720.
 Schoorl, P., 889.
 Schorsch, I. G., 213.
 Schoth, H. A., 325.
 Schowengerdt, G. C., 776.
 Schread, J. C., 232.
 Schroeder, C. H., 260, 679.
 Schroeder, C. R., 370.
 Schroeder, F. R., 801.
 Schubert, J. H., 377.
 Schueler, J. E., 14.
 Schultz, E. S., 631.
 Schultz, T. W., 121, 854.
 Schultze, A. B., 173, 464.
 Schultze, M., 559.
 Schultz, J. A., 866.
 Schulz, K. C. A., 534.
 Schulz, L., 576.
 Schulz, R. S., 102.
 Schuster, C. E., 482, 484.
 Schwabacher, H., 388.
 Schwaradt, H. H., 510, 806.
 Schwartz, B., 214, 251, 688, 695.
 Scism, S. F., 101.
 Scott, A. W., 246.
 Scott, C. E., 59, 632, 633.
 Scott, C. L., 285.
 Scott, G. W., 772.
 Scott, H. M., 466, 829.
 Scott, H. T., 560.
 Scott, J. R., 891.
 Scott, L. E., 758, 769.
 Scoville, G. P., 54, 855.
 Scrivner, L. H., 104, 257, 383.
 Scudder, H. D., 404.
 Sdobnikov, V. M., 651.
 Seaman, C. L., 587.
 Searing, L. D., 241.
 Searls, E. M., 502.
 Seibrell, W. H., 726.
 Seegers, W. H., 722.
 Seidenstein, H. R., 756.
 Seifriz, W., 749.
 Sefn, F. Jr., 655, 666.
 Sellick, N. P., 447.
 Sellman, R. L., 110.
 Seltzer, P., 298, 447.
 Selye, H., 313, 465.
 Semple, A. T., 87, 88, 90.
 Sen, B., 292.
 Sen, K. R., 176.
 Sen, S. K., 229.
 Sengbusch, R. v., 752.
 Senner, A. H., 545, 853.
 Sepulveda, G., Jr., 282.
 Serfontein, P. J., 171.
 Sergeant, E., 664.
 Serles, E. R., 445.
 Serra, A. B., 159.
 Servazzi, O., 210.
 Serviss, G. H., 770.
 Seto, F., 200.
 Severin, H. H. P., 348, 647.
 Sexton, H. D., 315.
 Shade, E. R., 448.
 Shaffner, F. I., 740.
 Shamel, A. D., 342.
 Shands, H. L., 467.
 Shands, R. G., 630.
 Shanks, G. L., 113.
 Shannon, R. C., 662.
 Shapiro, H. A., 172.
 Shapovalov, M., 633, 643.
 Sharp, J. G., 565.
 Sharp, M. A., 851.
 Shaughnessy, E. J., 587.
 Shaw, A. M., 715.
 Shaw, F. J. F., 606.
 Shaw, F. R., 73, 807.
 Shaw, J. N., 73.
 Shaw, L., 209, 632.
 Shaw, R. S., 144.
 Shawl, R. I., 115.
 Shealy, A. L., 370, 371, 376, 523.
 Shear, E. V., 632.
 Shear, G. M., 300.
 Sheard, C., 828.
 Shearer, P. S., 755.
 Sheehy, E. J., 682.
 Sheets, E. W., 87, 88, 370.
 Sheldon, H. P., 356.
 Shelow, E., 7.
 Shepard, C. E., 130.
 Shepard, H. H., 77.
 Shepherd, G., 123.
 Shepherd, G. S., 830, 854.
 Shepherd, J. B., 88.
 Sherbakoff, C. D., 195.
 Sherman, F., 807.
 Sherman, H. C., 442, 559, 891.
 Sherman, J. M., 377.
 Sherman, R. W., 857.
 Sherman, W. C., 559.
 Sherman, W. T., 895.
 Sherrard, F. R. G. N., 855.
 Sherrard, G. C., 816.
 Sherwood, I. R., 836.
 Sherwood, R. M., 238, 371.
 Shibasaki, Y., 196.
 Shift, M., 210.
 Shinn, E. H., 143.
 Shinohara, K., 291.
 Shiple, V., 474.
 Shippey, K. F., 702.
 Shippy, W. B., 346.
 Shiraki, T., 820.
 Shirky, S. B., 574.
 Shirlaw, J. F., 535.
 Shive, J. S., 26.
 Shive, J. W., 22, 167.
 Shoemaker, J. S., 47, 575, 621.
 Shoetensack, M., 536.
 Shope, R. E., 534.
 Shrader, J. H., 376, 740.
 Shrikhande, J. G., 748.
 Shultis, A., 404.
 Shultz, E. N., 853.
 Shutt, F. T., 608.
 Sideris, C. P., 63.
 Siegenthaler, J., 576.
 Siegler, E. H., 74, 80, 508.
 Sieglinger, J. B., 462.
 Sievers, F. J., 144.
 Silberschmidt, K., 458.
 Silcox, F. A., 2, 628.
 Silow, R. A., 168.
 Silver, J., 72.
 Simmins, G. B., 391.
 Simmons, P., 365.
 Simms, B. T., 73.
 Simon, F., 423.
 Simonnet, H., 566.
 Simpson, G. C., 160.
 Simpson, M. E., 604, 605.
 Sims, I. H., 55, 785.
 Sims, N. L., 272.
 Sinclair, H. M., 562, 730, 874.
 Sinclair, R. D., 673.
 Sinden, J. W., 769.
 Singh, H., 681.
 Singh, S., 770.
 Singh, T. S. N., 169.
 Singleton, W. R., 429, 771.
 Sinnott, E. W., 462.
 Sisson, W. A., 292.
 Sjogren, J., 767.
 Skaggs, S. R., 831.
 Skelley, W. C., 88, 90.
 Skidmore, L. V., 688.
 Skinner, C. E., 516.

- Skinner, J. J., 455, 494, 780.
 Skovsted, A., 320.
 Skriabine, K. J., 102.
 Skuderna, A. W., 323, 611.
 Slack, H. D., 805.
 Slagsvold, L., 534.
 Slagsvold, P. L., 268.
 Slate, G. L., 624, 627.
 Slate, W. L., 3, 145, 429.
 Slater, C. S., 449.
 Slawson, R. N., 376.
 Slesman, J. P., 500.
 Sleeth, B., 632.
 Sloanaker, J. R., 34.
 Small, C. G., 295.
 Smee, C., 502.
 Smirnov, A. I., 293.
 Smirnov, E., 217, 812.
 Smit, B., 817.
 Smith, A. H., 419.
 Smith, A. L., 641.
 Smith, A. M., 41.
 Smith, C., 623.
 Smith, C. B., 3.
 Smith, C. F., 501.
 Smith, C. N., 228.
 Smith, C. O., 196, 351, 632.
 Smith, C. W., 848.
 Smith, D. D., 539.
 Smith, D. E., 102.
 Smith, E., 337.
 Smith, E. C., 587.
 Smith, E. H., 66.
 Smith, E. H. G., 176.
 Smith, F. B., 304, 743, 757.
 Smith, F. E., 241.
 Smith, F. L., 462.
 Smith, F. R., 213.
 Smith, G. D., 17.
 Smith, G. M., 195.
 Smith, G. S., 325.
 Smith, H. E., 104.
 Smith, H. G., 722.
 Smith, H. H., 371.
 Smith, H. R., 845.
 Smith, J. H., 222.
 Smith, K. M., 197.
 Smith, L., 139, 574.
 Smith, L. E., 503.
 Smith, L. W., 228, 676.
 Smith, M. C., 726, 878.
 Smith, M. E., 739, 883, 885.
 Smith, M. L., 5, 6, 11.
 Smith, N. L., 437.
 Smith, O., 758, 770.
 Smith, P. E., 313, 465.
 Smith, R. E., 632, 633.
 Smith, R. H., 508.
 Smith, R. M., 821, 845, 846.
 Smith, R. R. F., 178.
 Smith, S. L., 144, 149, 865.
 Smith, S. N., 309, 269.
 Smith, T., 249, 289.
 Smith, T. O., 517.
 Smith, W. T., 244.
 Smyth, E. S., 775.
 Smyth-Homewood, G. R. B., 705.
 Smythe, D. W., 410.
 Snapp, O. I., 77, 79.
 Snedecor, G. W., 866.
 Snell, M. G., 370, 826.
 Snider, H. J., 179, 590, 746.
 Snyder, J. C., 341.
 Snyder, W. C., 489, 497, 625.
 Sobel A. E., 443.
 Sobotka, H., 441.
 Solov'ev, F. A., 803.
 Sommer, H. H., 524, 526.
 Sontag, L. W., 314.
 Sorenson, C. J., 359.
 Sotola, J., 241, 242.
 Sowell, D. F., 823.
 Spaeth, J. N., 457, 784.
 Spannhake, W., 264.
 Spaulding, E. H., 256.
 Spears, H. D., 517.
 Speelman, S. R., 113.
 Spence, C. C., 855.
 Spence, H. L., 476.
 Spencer, M. B., 377.
 Spencer, V. E., 452.
 Sperry, C. C., 651.
 Sperry, O. E., 344.
 Speyer, W., 217.
 Spiegel-Adolf, M., 581.
 Spier, J. D., 169, 598.
 Spindler, L. A., 214, 688.
 Sprague, D. C., 769.
 Sprague, G. F., 38.
 Sprague, G. W., 854.
 Sprague, H. B., 14, 26, 35, 319.
 Sprague, R., 491, 632, 791.
 Sprague, V. G., 502.
 Sprengel, L., 809.
 Spruijt, F. J., 80.
 Spruyt, J. P., 282.
 Squire, F. A., 662, 808.
 Sreenivasaya, M., 582.
 Sreerangachar, H. R., 582.
 Srikantaiah, G. N., 534.
 Stableforth, A. W., 104, 833.
 Stabler, H. O., 55.
 Stadler, L. J., 466.
 Stafseth, H. J., 107, 845.
 Stahl, A. L., 327, 779.
 Stakman, E. C., 489, 632.
 Stanford, E. E., 165.
 Stanford, J. S., 501.
 Stanley, A. R., 631.
 Stanley, J., 817.
 Stanley, W. M., 643, 799.
 Stanley, W. W., 78, 345.
 Stantial, H., 151.
 Stanton, T. R., 62, 470, 764.
 Stapledon, R. G., 317.
 Staples, C. H., 96.
 Stapley, J. H., 510.
 Stare, F. J., 560.
 Stark, C. N., 377.
 Stark, P., 377.
 Starker, T. J., 57.
 Starkey, L. V., 370, 823.
 Staroselskii, A., 174.
 Starr, S. H., 894.
 Starring, C. C., 184.
 Staryzina (Staryghina), L., 686.
 Stauber, B. R., 118.
 Stearns, L. A., 228.
 Stebbing, M. E., 192.
 Steck, L. J., 854.
 Steele, H. V., 811.
 Steenbock, H., 380, 418, 560, 571, 879.
 Steensberg, V., 674.
 Steinbauer, C. E., 184.
 Stein-Beling, I. von, 232.
 Steinberg, R. A., 347.
 Steinegger, P., 618, 753.
 Steiner, G., 59, 491, 648.
 Steiner, H., 203.
 Steinmetz, F. H., 354.
 Steinweden, J. B., 361.
 Stelzner, G., 771.
 Stene, A. E., 341.
 Stephens, J. C., 42, 470.
 Stephens, J. L., 761.
 Stephenson, R. E., 19, 24, 161.
 Stern, A., 872.
 Stevens, F. D., 298, 316.
 Stevens, G. A., 192.
 Stevens, J. C., 393.
 Stevens, K. R., 298.
 Stevens, L. A., 742.
 Stevens, N. E., 59, 195, 431.
 Stevenson, A. E., 740.
 Stevenson, J. A., 631.
 Stevenson, T. M., 181.
 Stevenson, W. H., 855.
 Steward, F. C., 458.
 Stewart, G., 609.
 Stewart, J., 855.
 Stewart, M. A., 383, 815.
 Stewart, R., 452.
 Stewart, W. D., 300.
 Stewart, W. L., 387.
 Steyn, D. G., 529.
 Stickney, F. S., 507.
 Stiebeling, H. K., 134.
 Stiles, C. F., 818.
 Stine, O. C., 853.
 Stitt, R. E., 766.
 Stockberger, W. W., 616.
 Stockton, R. C., 263.
 Stoerr, E., 422.
 Stoichkov, I. P., 774, 775.
 Stoitschkoff, J. P., 774, 775.
 Stokdyk, E. A., 430.
 Stokes, W. E., 316, 327, 371.
 Stoneback, W. J., 616.
 Stoner, N. B., 722.
 Storch, H. H., 703.
 Stout, E. N., 537.
 Stout, G. J., 183, 769, 770.

- Stout, O. V. P., 111.
 Stoutemyer, V. T., 341, 769.
 Stover, H. J., 410, 860.
 Stover, W. G., 632.
 Stracener, C. L., 75.
 Straib, W., 62.
 Strand, A. L., 807.
 Strauss, M. B., 569.
 Street, O. E., 50.
 Streeter, R. L., 399.
 Streets, R. B., 346, 633.
 Strickland, A. G., 185, 352.
 Stroman, G. N., 763.
 Strong, L. A., 652.
 Strong, L. C., 603.
 Stuart, A. W., 860.
 Stuart, E. H., 443.
 Stuart, H. O., 374.
 Stuart, W., 41.
 Studebaker, J. W., 2.
 Stuntz, D. E., 633.
 Sturgis, C. C., 892.
 Sturgis, M. B., 315, 454.
 Sturkie, D. G., 315.
 Sturtevant, A. P., 666.
 Stütz, H., 175.
 Stylianopoulos, M., 258.
 Subramaniam, T. V., 368.
 Sudds, R. H., 190, 769.
 Sudworth, G. B., 57.
 Sueur, A. D. C. Le, 192.
 Suit, R. F., 645.
 Sullivan, J. T., 61.
 Sullivan, R. A., 823.
 Sullivan, W. N., 503.
 Summer, C. B., 498.
 Summers, E. M., 642.
 Summerville, W. A. T., 225.
 Sumner, C. B., 789.
 Sumner, F. B., 312.
 Sumner, J. B., 442.
 Sundelin, G., 751.
 Sundt, A., 285.
 Suñer, J. P., 870.
 Suneson, C. A., 325.
 Supplee, G. C., 245, 378, 523, 525, 683.
 Sure, B., 585, 885.
 Sutherland, J. L., 325.
 Sutton, J. G., 111.
 Sutton, T. S., 523.
 Suzman, M. M., 881.
 Suzuki, H., 202.
 Suzuki, U., 569.
 Svanberg, O., 288.
 Svensson, S., 105.
 Swain, R. B., 215.
 Swales, W. E., 251.
 Swan, D. C., 670.
 Swanson, A. F., 325, 462.
 Swanson, C. O., 204.
 Swanson, P. P., 769, 866.
 Swarbrick, T., 233.
 Swartwout, H. G., 476, 488, 501.
 Swartz, D., 787.
 Sweeting, B., 241, 242.
 Swenson, A. C., 560.
 Swenson, T. L., 87, 521.
 Swett, W. W., 95.
 Swift, R. W., 371, 823.
 Swingle, D. B., 598.
 Swingle, M. C., 358.
 Swingle, W. T., 593.
 Swope, W. D., 831.
 Sykes, J. F., 236.
 Szilvinyi, A. von, 576, 588.
 Szymkiewicz, D., 588.
 Tabashi, I., 218.
 Taberner, F. R., 843.
 Tabor, P., 315, 325.
 Takahashi, M., 469.
 Takahashi, W. N., 632, 643.
 Takato, R., 366.
 Talarewitch, E., 530, 531.
 Talbert, T. J., 476, 501, 622, 774.
 Tanaka, K., 732.
 Tandon, S. P., 164.
 Tannehill, I. R., 13.
 Tanner, F. W., 869.
 Tanret, G., 155.
 Tapke, V. F., 200.
 Tapley, W. T., 329, 330.
 Tarassuk, N. P., 524.
 Tarr, H. L. A., 819.
 Taschdjian, E., 763.
 Tashlanov, A. N., 321.
 Tate, L. B., 854.
 Tatamatsu, K., 585.
 Tattersfield, F., 809, 810.
 Tatum, E. L., 436.
 Taub, S. J., 570.
 Taubenhaus, J. J., 345, 346, 794.
 Tauber, H., 294.
 Taussig, S., 861.
 Tavernetti, J. R., 400, 545.
 Tavernetti, T. F., 430.
 Taylor, C. A., 192.
 Taylor, C. C., 708, 853.
 Taylor, C. F., 788.
 Taylor, E. L., 103, 694, 837.
 Taylor, F. H. L., 877.
 Taylor, G. E., 243.
 Taylor, J. C., 143.
 Taylor, L. W., 172.
 Tchakirian, A., 802.
 Tchernozatonskaia, E. P., 465.
 Teare, D. W., 315.
 Teixeira de Freitas, J. F., 697.
 Templeton, H. L., 524, 526.
 Templin, V. M., 571.
 Ten Broeck, C., 695.
 Tepper, A. E., 546.
 Terada, S., 601.
 Terhune, H. W., 804.
 Terrell, W. G., 517.
 Terrill, C. E., 465.
 Tetley, J. H., 841.
 Thatcher, L. E., 608.
 Theiler, A., 102.
 Theiler, M., 530.
 Thelin, G., 761.
 Theophilus, D. R., 241, 242, 377.
 Thies, W. H., 618.
 Thimann, K. V., 597.
 Thomas, B., 516.
 Thomas, B. H., 517, 822, 830.
 Thomas, C. A., 807.
 Thomas, E. F., 371, 391.
 Thomas, H. Earl, 68, 633.
 Thomas, Harold E., 633.
 Thomas, H. L., 709.
 Thomas, L. A., 332.
 Thomas, M. T., 317.
 Thomas, R., 889.
 Thomas, R. P., 13, 14.
 Thomas, S. B., 684.
 Thompson, E. C., 248.
 Thompson, G. B., 514.
 Thompson, H. B., 720.
 Thompson, H. C., 51, 182, 770, 771.
 Thompson, R., 385.
 Thompson, R. B., 238, 371.
 Thompson, R. C., 329.
 Thompson, W. C., 88, 91, 107, 374.
 Thompson, W. L., 221, 358, 810.
 Thompson, W. R., 229, 232, 807.
 Thompson, W. W., 107.
 Thomsen, L. C., 524.
 Thomsen, M., 664.
 Thomsen, O., 603.
 Thomson, D. L., 313.
 Thomson, J. R., 77, 79.
 Thorén, S., 9.
 Thorne, G., 650.
 Thornton, H. G., 468.
 Thornton, M. H., 25.
 Thornton, N. C., 593.
 Thornton, S. F., 303.
 Thorp, F., Jr., 538.
 Thorpe, W. H., 816.
 Throckmorton, R. I., 287.
 Thrun, F. M., 712.
 Thung, T. H., 799.
 Thurston, H. W., Jr., 776, 790.
 Thurston, L. M., 524.
 Tilford, P. E., 632.
 Tiller, L. W., 777.
 Tilt, J., 137.
 Timmis, R. S., 373.
 Timmons, F. L., 430.
 Tims, E. C., 346, 632, 766.
 Ting, P. C., 653.
 Ting, Y., 323.
 Tingey, D. G., 316, 347, 475.
 Tinley, J. M., 405.
 Tinley, N. L., 91.
 Tischler, G., 593.
 Tisdale, W. B., 346, 347.

- Tisdall, F. F., 522.
 Tissot, A. N., 358, 812.
 Titus, H. W., 87, 237, 520, 829.
 Todd, 463.
 Todd, C., 697.
 Todd, F. E., 405.
 Todd, J. N., 807.
 Todd, R. W., 560.
 Toens, P., 686.
 Togashi, K., 195, 196.
 Toit, R. M. du, 529.
 Tolle, C. D., 880.
 Tollenaar, D., 324.
 Tolley, H. R., 3, 146, 577, 853, 856.
 Tom, R. C., 674, 675.
 Tomkins, R. G., 773.
 Tomlinson, J. W., 852.
 Tompkins, C. M., 632, 633.
 Toole, E. H., 34.
 Topacio, T., 103.
 Toro, R. A., 460.
 Torre Bueno, J. R. de la, 807.
 Torrey, J. P., 391, 538.
 Torrie, J. H., 180, 615.
 Toscani, V., 724, 725.
 Tottingham, W. E., 456, 457, 560.
 Tough, R., 717.
 Townsend, G. R., 208, 327, 347.
 Townsend, T. H., 129.
 Toy, L. R., 779.
 Tracy, P. H., 687.
 Trannoy, R., 589.
 Traub, H. P., 483, 484, 779, 781.
 Travis, B. V., 215, 230.
 Trayer, G. W., 262, 395, 543.
 Treadgold, H. A., 415.
 Trebler, H. A., 376.
 Treichler, R., 244.
 Trelogan, H. C., 525.
 Tressler, D. K., 158, 297.
 Tretsven, J. O., 242.
 Triebold, H. O., 785, 823, 868.
 Trimble, H. E., 816.
 Tripp, F., 138.
 Trought, T., 177, 320.
 Trout, G. M., 246, 377.
 Trowbridge, E. A., 514, 515.
 True, A. C., 433.
 Trumble, H. C., 318.
 Truog, E., 295, 448, 745.
 Tsai, P. H., 432.
 Tschudy, L. C., 111.
 Tsuji, Y., 250.
 Tubeuf, C. von, 70, 71.
 Tucker, C. M., 488.
 Tucker, E. M., 893.
 Tucker, H. H., 98.
 Tucker, L. R., 336.
 Tucker, R. P., 657.
 Tucker, R. W. E., 655, 661, 665, 668, 669.
 Tuckey, S. L., 524, 682.
 Tufts, W. P., 188, 338, 480.
 Tukey, H. B., 480, 621, 773.
 Tullis, E. C., 491, 632, 641, 787.
 Tully, W. C., 92.
 Tunison, A. V., 822.
 Turk, K. L., 523, 823.
 Turner, A. J., 320.
 Turner, A. W., 105.
 Turner, C. W., 33, 99, 172, 173, 464, 523, 524, 525, 832.
 Turner, J. D., 517.
 Turner, J. R., 144.
 Turner, L. M., 625, 784.
 Turner, N., 429.
 Turner, R. M., 242, 243.
 Tuttle, A. R., 716.
 Twining, F. M., 376.
 Tydeman, H. M., 333, 340.
 Tyndale, H. H., 465.
 Tysdal, H. M., 319, 762.
 Uhrová, A., 749.
 Uichanco, L. B., 806.
 Ukkelberg, H. G., 632.
 Ulyett, G. C., 320, 365.
 Ulrey, O., 124.
 Ulrich, A., 217.
 Umberger, H. J. C., 3, 144, 145.
 Underhill, G. W., 223.
 Underwood, C., 320.
 Underwood, F. O., 476.
 Upfold, S. J., 855.
 Upp, C. W., 91, 94, 171, 371, 603.
 Uren, A. W., 528, 840.
 Urquhart, L. C., 701.
 Uvarov, B. P., 811.
 Valentine, G. M., 685.
 Valteau, W. D., 432.
 Vallée, H., 839.
 Vallée, M., 839.
 Van Antwerpen, M., 376.
 van Beynum, J., 686.
 Vandecaveye, S. C., 163.
 van der Poel, J., 207.
 Van Donk, E. C., 560.
 Van Dyck, W. J. D., 114.
 Van Es, L., 843.
 Van Eseltine, G. P., 329, 616, 652.
 Van Landingham, A. H., 523.
 Van Roekel, H., 537, 538.
 van Schreven, D. A., 799.
 Vansell, G. H., 368, 666.
 Van Slyke, D. D., 891.
 Vantine, J. T., 175.
 Van Fleet, G., 807.
 Van Volkenberg, H. L., 531.
 Vanwijngaerden, G., 817.
 Vasquez, N. F., 16, 18, 19, 23.
 Vass, A. F., 710.
 Vavilov, N. I., 142, 461.
 Vecten, 696.
 Vega, P. G., 283.
 Veihmeyer, F. J., 340.
 Veitch, F. P., 345.
 Vekhov, N. K., 53.
 Velu, H., 694.
 Venkata Rao, M. G., 803.
 Venkatraman, T. S., 606.
 Venn, J. A., 266.
 Vermillion, M. T., 632.
 Verner, L., 186, 430.
 Vernon, E. M., 159.
 Verrall, A. F., 803.
 Veselovskaja, M. A., 177.
 Vesselovskaya, M., 177.
 Viala, P., 646.
 Vickers, G. S., 241.
 Vielwerth, V., 499.
 Viemont, B. M., 139.
 Viennot-Bourgin, G., 644.
 Viennot-Bourgin, M. F., 489.
 Viljoen, P. R., 707.
 Villadolid, D. V., 805.
 Villanueva, B. R., 163.
 Villanueva, E. R., 868.
 Vinall, H. N., 87.
 Vincent, C. G., 430.
 Vinson, C. G., 476, 488, 501, 632.
 Violle, H., 837.
 Viridén, 839.
 Virtue, B. T., 851, 853.
 Viswanatha Iyer, A., 826.
 Voelcker, J. A., 35.
 Vogel, H. A., 401, 430, 861.
 Vogt, C. J., 703.
 Vogt, K., 270.
 Vol'ferts (Volfertz), A. A., 838.
 Volk, N. J., 295, 448.
 Volk, O. H., 593.
 Volkenberg, H. L. Van, 531.
 Volz, E. C., 343, 768.
 Voorhees, R. K., 346, 794.
 Voorhies, E. C., 410.
 Voris, L., 371, 823.
 Voss, J., 596.
 Vyvyan, M. C., 333, 334.
 Waddell, J., 245, 888.
 Wade, B. L., 640.
 Wade, C. I., 736.
 Wade, J. S., 366.
 Wadsworth, H. A., 741.
 Wagener, K., 388.
 Wagle, P. V., 225.
 Wabby, A. M., 691.
 Wait, B., 134.
 Wait, B. C., 575.
 Waite, M. B., 59.
 Waite, W. C., 714, 853.
 Wakeland, C., 368, 814.
 Wakeley, R. E., 864.

- Waksman, S. A., 14.
 Wald, G., 280.
 Walden, B. H., 429.
 Walden, D. C., 130.
 Waldo, G. F., 190, 340, 482, 624.
 Walker, A. L., 553.
 Walker, C. E., 268.
 Walker, F. W., 358, 509.
 Walker, G., 160.
 Walker, G. P., 13, 302.
 Walker, J. C., 432, 489, 632, 639.
 Walker, L. S., 25, 89, 673.
 Walker, M. N., 346, 352.
 Walker, R. H., 28, 164, 743.
 Walker, W. P., 863.
 Wall, R. F., 236.
 Wall, S., 693.
 Wallace, B. A., 407.
 Wallace, D. B. J., 37, 318, 758.
 Wallace, E. R., 765.
 Wallace, H. A., 141, 707, 735.
 Wallace, R. W., 758, 769.
 Waller, A. G., 124.
 Wallrabenstein, P. P., 716.
 Walsh, W. F., 158.
 Walter, D. H., 861.
 Walter, J. M., 639.
 Walton, C. L., 510.
 Walton, T. O., 2, 143, 146.
 Wann, F. B., 347.
 Wann, J. L., 402.
 Wanner, E., 779.
 Warbritton, V., 465.
 Warburton, C., 710.
 Warburton, C. W., 3, 577.
 Ward, A., 568.
 Ward, J. W., 393.
 Ward, K. M., 225.
 Wardlaw, C. W., 52, 331, 780.
 Wardle, R. A., 257.
 Ware, J. O., 346, 756, 786.
 Ware, W. M., 63, 67, 68.
 Wariar, U. A., 178.
 Warington, K., 305.
 Warner, J. D., 316.
 Warner, K. F., 87, 370.
 Warning, W. C., 330.
 Warren, C. R., 570.
 Warren, D. C., 172, 466, 829.
 Warren, G. F., 2.
 Warren, T. R., 97.
 Warwick, T., 804.
 Washburn, R. G., 523.
 Watanabe, S., 250.
 Watanabe, T., 207.
 Watchorn, E., 875.
 Waters, N. F., 755, 822, 843.
 Watkin, J. E., 611.
 Watkins, A. E., 320.
 Watson, A. N., 595.
 Watson, C. J., 517.
 Watson, E. B., 813.
 Watson, J. R., 346, 358, 818.
 Watson, P. D., 523.
 Watson, S., 146.
 Watson, S. J., 234, 758.
 Watt, J. R., 311.
 Watts, J. G., 506, 807, 811.
 Watts, R. L., 3, 145, 146, 894.
 Watts, V. M., 756, 768, 772.
 Watzl, O., 217.
 Waugh, F. V., 853.
 Waugh, J. G., 773.
 Waugh, W. A., 379.
 Waynick, D. D., 328.
 Weatherwax, P., 762.
 Weaver, C. H., 390.
 Weaver, E., 375, 376, 524.
 Weaver, J. E., 318.
 Weaver, L. A., 514.
 Weaver, O. T., 854.
 Webb, B. H., 525.
 Webb, J. E., 807.
 Webber, H. J., 191, 626.
 Webber, J. M., 31, 461.
 Weber, G. F., 345, 346.
 Webster, C. F., 243.
 Webster, R. L., 358, 364, 814.
 Weckel, K. G., 523, 526.
 Weech, A. A., 891.
 Weetman, L. M., 788.
 Wegner, E. E., 242.
 Wehmeyer, L. E., 489.
 Wehr, E. E., 214.
 Wehrwein, G. S., 854.
 Weidemann, A. G., 286, 706.
 Weidlich, G., 586.
 Weightman, R. H., 160.
 Weil, L., 294.
 Weill, L., 423.
 Weimer, B. R., 699.
 Weinard, F. F., 783.
 Weindling, R., 632, 633, 790.
 Weis, A., 564.
 Weiser, V. L., 24.
 Welch, D. S., 632, 788, 802.
 Welch, H., 693, 825.
 Welch, R. C., 831.
 Weller, E. P., 267.
 Wellington, R., 333, 336.
 Wellman, F. L., 195, 496, 639, 647.
 Wells, E. B., 430.
 Wells, J. B., 262.
 Welton, F. A., 608.
 Wenck, P., 459.
 Wenstrom, W. H., 741.
 Went, F. W., 457, 597.
 Went, J. C., 64.
 Wentworth, S. W., 187.
 Wentz, J. B., 309, 757.
 Wentzel, S. F., 755.
 Werkman, C. H., 440, 739.
 Werner, O., 203.
 Wessels, P. H., 770.
 West, C., 421.
 West, D. C., 776.
 West, E., 347.
 West, E. S., 444.
 Westbrook, L., 3.
 Westenbrink, H. G. K., 417, 420.
 Wester, R. E., 349, 493, 631.
 Westerlund, A., 288.
 Westersheim, W. v. W., 628.
 Westgate, J. M., 429.
 Westin, G., 569.
 Weston, W., 871.
 Westover, H. L., 34, 181, 319.
 Westover, K. C., 183.
 Wetmore, A., 650, 805.
 Wettstein-Westersheim, W. v., 628.
 Wexelsen, H., 309.
 Wheeler, C. M., 389.
 Wheeler, H. W., 223.
 Whelan, L. A., 685.
 Whetten, N. L., 127.
 Whipple, O. C., 632.
 Whitacre, J., 134, 136.
 Whitaker, R., 524.
 Whitby, H., 855.
 Whitcomb, W. D., 358.
 Whitcomb, W. O., 719.
 White, C., 424.
 White, G. F., 689.
 White, H. A., 855.
 White, H. E., 783.
 White, J. W., 831.
 White, P., 891.
 White, P. R., 185, 642.
 White, R. P., 631, 648, 801.
 White, R. S., 662.
 White, W. I., 622.
 White, W. L., 790.
 White, W. T., 601.
 Whitefield, B. H., 834.
 Whitehead, H. R., 833, 836.
 Whitehead, W. E., 820.
 Whiteside, A. G. O., 325, 615.
 Whitlow, S. E., 243.
 Whitney, G. M., 764.
 Whittaker, C. W., 165.
 Whitworth, S. H., 689.
 Whornham, G., 316.
 Whyte, R. O., 174.
 Wiancko, A. T., 13.
 Wichers, H. E., 735.
 Wicks, W. H., 654.
 Wickware, A. B., 697.
 Wickwire, G. C., 593.
 Widdows, S. T., 278.
 Wieland, E., 728.

- Wieler, A., 490.
 Wiener, A. S., 463.
 Wiggans, C. B., 768.
 Wiggans, R. G., 42, 758.
 Wigle, D. A., 846.
 Wilbur, D. A., 82.
 Wilbur, J. W., 523.
 Wilcke, H. L., 822, 843.
 Wilcox, D. E., 245.
 Wilcox, R. B., 632.
 Wilcox, W. W., 127.
 Wilcoxon, F., 503, 631.
 Wilder, O. H. M., 671, 672.
 Wilder, R. M., 828.
 Wildt, J. C. de R. de, 234.
 Wiley, W. J., 380.
 Wilgus, H. S., Jr., 823.
 Wilhelm, A. F., 595.
 Wilkins, F. S., 609, 757.
 Wilkins, W. E., 445.
 Willard, C. J., 608.
 Willard, H. S., 96, 523.
 Willard, R. E., 119, 122, 708, 896.
 Wille, J., 814, 818.
 Williams, B. O., 129.
 Williams, C. B., 43, 315, 320, 449, 455, 507.
 Williams, C. G., 144.
 Williams, C. H. B., 178.
 Williams, G. W. M., 659.
 Williams, J. C., 727.
 Williams, J. O., 113.
 Williams, O. E., 687, 836.
 Williams, P. S., 831.
 Williams, R. D., 168, 317.
 Williams, R. H., 236.
 Williams, R. M., 854.
 Williams, S. W., 123.
 Williamson, P. S., 855.
 Willis, R. L., 617.
 Willis, W. H., 19.
 Willman, J. P., 106, 822, 823.
 Wilmoth, J. H., 688.
 Wilsie, C. P., 469.
 Wilson, A. L., 327, 347.
 Wilson, A. N., 234.
 Wilson, C., 156.
 Wilson, C. A., 134.
 Wilson, E. E., 355, 632, 633.
 Wilson, F. H., 506.
 Wilson, G. W., 241, 242.
 Wilson, H. F., 502.
 Wilson, H. L., 836.
 Wilson, J. B., 701.
 Wilson, J. D., 197, 198, 490, 608, 632, 790, 801.
 Wilson, J. J., 787.
 Wilson, J. K., 302.
 Wilson, J. W., 358, 813.
 Wilson, L., 316, 327.
 Wilson, L. T., 97, 245, 523.
 Wilson, M. L., 3, 146.
 Wilson, M. M., 734.
 Wilson, P. W., 27, 448, 459, 751.
 Wilson, T. R. C., 543.
 Wilson, W. K., 828.
 Wilster, G., 241.
 Winant, H. B., 13.
 Windle, E. G., 192.
 Wingard, S. A., 632.
 Wingerberg, F., 640.
 Winkler, A. J., 625.
 Winston, J. R., 69.
 Winterberg, S. H., 23.
 Winterkorn, H. F., 448, 450.
 Winzenburger, W., 601.
 Wiolovitsh, N., 217.
 Wiseman, W. R. B., 741.
 Wishart, J., 320.
 Wislocki, G. B., 313.
 Wismer, C. A., 492.
 Wisnicky, W., 694.
 Withey, M. O., 397.
 Witts, L. J., 891.
 Woglum, R. S., 362, 657.
 Wolbach, S. B., 885.
 Wolcott, G. N., 655.
 Wolfe, H. S., 316, 327, 779.
 Wolff, J., 421.
 Wolters, W., 816.
 Wonser, C. H., 744.
 Wood, D. C., 853.
 Wood, E. L., 431.
 Wood, F., 842.
 Wood, F. D., 531, 837.
 Wood, H. G., 440.
 Wood, I. H., 869.
 Wood, O. M., 487.
 Wood, R., 242.
 Woodman, H. E., 234.
 Woodman, R. M., 770.
 Woodroof, J. G., 54, 485.
 Woodroof, N. C., 54, 485.
 Woodrow, A. W., 807.
 Woodruff, C. W., 448.
 Woods, J. B., 846.
 Woods, M. W., 632.
 Woodworth, P. M., 542.
 Woodworth, R. H., 459.
 Woodyatt, R. T., 891.
 Wooley, J. C., 539, 550.
 Woolf, D. O., 702.
 Work, R. A., 480, 540.
 Work, S. H., 524, 830.
 Wormald, A., 436.
 Worner, R. K., 284.
 Woronin, M., 749.
 Worthley, H. N., 776, 807.
 Worthley, L. H., 74.
 Worzella, W. W., 600.
 Wray, E. M., 53.
 Wright, A. A., 500.
 Wright, A. H., 467, 500.
 Wright, E. B., 205.
 Wright, E. J., 419.
 Wright, H. E., 250.
 Wright, K. T., 269.
 Wright, M. D., 260.
 Wright, N. C., 834.
 Wright, T. S., 677.
 Wright, W. H., 843.
 Wrigley, P. I., 854.
 Wursten, J. L., 301.
 Wyllie, C. E., 376.
 Wyllie, J., 270.
 Wyman, D., 192, 782, 784.
 Wymore, F. H., 362.
 Wyrick, W. J., 242.
 Wyssling, A. F., 750.
 Yale, H. C., 130.
 Yale, M. W., 376.
 Yamamoto, S., 250.
 Yamauchi, T., 670.
 Yampolsky, C., 597.
 Yarnell, D. L., 110, 541.
 Yarwood, C. E., 351, 493.
 Yata, Y., 250.
 Yavorsky, M., 885.
 Yeager, J. F., 215.
 Yeates, G. K., 500.
 Yeung, K. C., 665.
 Yoder, L., 822.
 Yoneda, A., 585.
 Yothers, W. W., 220.
 Young, G. E., 854.
 Young, H. C., 818.
 Young, M. T., 82.
 Young, P. A., 498, 632.
 Young, T. D., 101.
 Young, V. H., 346, 786.
 Youngquist, I. W., 243.
 Yudkin, A. M., 726, 727.
 Yuen, Q. H., 304.
 Yuill, J. L., 438.
 Yutuc, L. M., 535, 842.
 Zagami, V., 457.
 Zahnley, J. W., 181.
 Zaumeyer, W. J., 632, 640.
 Zeller, J. H., 87.
 Zetterberg, J. M., 747.
 Zhukovskii, P. M., 142.
 Zhuravskafa, N. P., 12.
 Zickler, H., 751.
 Ziegler, P. T., 823.
 Zilva, S. S., 421.
 Zimmerman, B., 238.
 Zimmerman, O. B., 851.
 Zinichenko, N. P., 321.
 Zinsser, H., 381.
 Zobel, I. D., 316, 327.
 Zon, R., 448.
 Zondek, B., 34.
 Zottner, G., 694.
 Zwarenstein, H., 172.
 Zwölfer, W., 216.

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.", "Conn.[New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R." to those of the experiment stations in Hawaii and Puerto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

Ataca bunchy top, notes, 789.
 Abortion—*see also* *Brucella abortus*.
 and tuberculosis of bovines, simultaneous diagnosis, 254.
 bovine and equine, Ky. 102.
 compulsory tests, results, Mich. 255.
 control and eradication, 104.
 control with commercial dead vaccine, 256.
 entrance to body through skin or eye, U.S.D.A. 102.
 in cattle, diagnostic measures, comparison, 255.
 in cattle in Great Britain, 255.
 in cattle, length of incubation period, 693.
 in cattle, rapid agglutination test for, 384.
 in cattle, transmission from immune dams to progeny, Mo. 528.
 in dairy herds, eradication, Idaho 102.
 in domestic animals in Great Britain, 382.
 in Nevada, 528.
 in station dairy herd, Vt. 838.
 in swine, transmission to cattle, Mo. 528.
 nonreacting and susceptible cattle, safe mingling, Wis. 529.
 relation to mastitis, 385.
 studies, 242, 837; Calif. 689; U.S.D.A. 528; Utah 382.
 summary, Wyo. 383.
 vaccination of calves against, 104.
 vibriotic, of sheep, 387.
Abutilon, variegation, seed transmission of virus causing, 631.
Acanthocephala spp., notes, Fla. 358.
Acantholoma denticulata, biology, 224.
 Acarids in tobacco storehouses, 670.
 Acarina, suborders and superfamilies, 214.
 Accounting, farm, *see* Farm accounts.
 Acetaldehyde production by tomatoes, 51.
 Acetonemia, acid-base balance during and after pregnancy, 692.
 Acid phosphate, *see* Superphosphates.

Acids—
 amino, *see* Amino acids.
 fatty, *see* Fatty acids.
 from smoke, soil-disturbing effect, 490.
Acrobasis caryae, *see* Pecan nut casebearer.
Acrosternum hilaris, *see* Stinkbug, green.
Actinomyces—
 in milk, 683.
 necrophorus in calf diphtheria, studies, 104, 257.
 necrophorus, notes, 106, 389; Wyo. 694.
 spp. from scabby potatoes, 640.
Acuarua anthuris, notes, 214.
Adelphocoris superbus, notes, 359.
 Adenine sulfate as source of vitamin B₁ for growth, 585.
 Adhesives, spray tests with, Ky. 74.
 Adrenal cortex, antiscorbutic action, 732.
Aedes mosquito plague, development, 217.
Aegeria exitiosa, *see* Peach borer.
Aegeria pictipes, *see* Peach borer, lesser.
Agriolops and rye hybrids, seed setting, morphology, and fertility, 752.
Acthalochroa ashmoleana, biology, 658.
 Agalactia, contagious, of sheep and goats, causative organism, 840.
 Agglutinins, developments in study, 837.
 Agrarian reform in Bulgaria, 856.
 Agricultural—
 Adjustment Act—
 and established economic law, U.S.D.A. 118.
 corn and hogs under, 267.
 corn-hog program, incidence of cost of, 123.
 cotton under, 407.
 dairy products under, 267.
 wheat under, 268.
 Adjustment Administration—
 Program Planning Division, 856.
 relation to agricultural economics extension work in South, 853.
 adjustment measured in progress toward parity prices, U.S.D.A. 123.
 adjustment program, international aspects, 707.

Agricultural—Continued.

- census and intercensal data, administrative use, 853.
- census enumerations, coming, 853.
- college education, aspects, 558.
- colleges, *see* Iowa, Kansas, Massachusetts, *etc.*
- colonization, *see* Land settlement.
- commodities, assembling by retailers, 1930 census data, 716.
- commodities, prices in England and Wales, 266.
- cooperation in Hungary, 863.
- credit in Italy, 863.
- credit, relation to branch banking, 713.
- credit situation in light of recent developments, Okla. 401.
- credit, sources, [N.Y.] Cornell 855.
- credits, report of Committee on Rural Appraising, 853.
- development of South Africa, significance, 708.
- directory, international, 275.
- economic literature, bibliography, 854.
- economics, graduate major in, undergraduate preparation, 854.
- economics research, papers on, 853.
- Education, International Congress, proceedings, 865.
- education, vocational, in Illinois, 275.
- education, vocational, in Philippines, teachers of, 275.
- engineering, *see* Engineering.
- experiment stations, *see* Experiment stations.
- extension, *see* Extension.
- implement type of spoked wheels, technical analysis, 851.
- income, British, distribution, 266.
- indebtedness, State measures for relief, U.S.D.A. 551.
- index, 1858-1931 in Chinese and English, 142.
- industry in Union of South Africa, rehabilitation, 856.
- journals, new, 288, 432, 576.
- leaders, directory, 275.
- legislation, international yearbook, 270.
- machinery—*see also* Combines, Thresher, *etc.*
 - congress of, 113.
 - ferrous metals in, treatment and properties, 544.
 - for corn borer control, U.S.D.A. 705.
 - for dusting cotton, U.S.D.A. 117.
 - upkeep, Md. 110.
- Marketing Act, 1933, 267.
- outlook for Illinois, Ill. 709.
- outlook for 1935, U.S.D.A. 548.
- products—
 - farm value, gross and cash income, U.S.D.A. 860.
 - marketing, *see* Marketing.

Agricultural—Continued.

- products—continued.
 - of Arizona, freedom from pests, 654.
 - of Kentucky, prices, Ky. 118.
 - prices and purchasing power, Okla. 707.
 - prices August 1934, Ohio 547.
 - prorate act, California, provisions, 856.
 - recovery, prospects for, Iowa 124.
 - research and plant protection, coordination in East Africa, 789.
 - research at 1934 convention of Association of Land-Grant Colleges and Universities, 145.
 - research, coordination, editorial, 577.
 - Research Council, report, 578, 735.
 - research institutes, British, work of, 735.
 - resources, factors affecting use, Idaho 401.
 - situation, general, Okla. 401, 707.
 - situation in 1932-33, 267.
 - situation, 1934, U.S.D.A. 707.
 - statistics, U.S.D.A. 126.
 - statistics, Belle Fourche (S.Dak.) reclamation project, U.S.D.A. 859.
 - statistics, new Chinese, 854.
 - statistics of Ohio, Ohio 716.
 - statistics, papers on, 853.
 - tenancy, *see* Farm and Land tenancy.
 - training in Canada, 559.
- Agriculture—
 - and the state, 266.
 - balanced, achieving, U.S.D.A. 548.
 - cost per unit as measure of efficiency in, 267.
 - Department of, *see* United States Department of Agriculture.
 - economic survey in eastern part of England, 402.
 - electricity in, *see* Electricity.
 - first problems in, textbook, 130.
 - in Russia, reconstruction and growth of production, 854.
 - of South Africa, report of Secretary, 707.
 - recent economic planning in, 856.
 - subtropical, role of research in, Calif. 626.
 - trends in Washington, 1900 to 1930, Wash. 119.
 - tropical, bibliography of, 142.
 - Turkish, manual, 142.
- Agilus sinuatus*, *see* Pear tree borer, sinuate.
- Agriotes lineatus*, biology, 217.
- Agriotes obscurus*, biology, 217.
- Agromyza simplex*, *see* Asparagus miner.
- Agrotis ypsilon*, *see* Cutworm, black.
- Air, upper, spores in, 631.
- Airplane vapor spraying, 360.
- Alaska Station, notes, 143.
- Albugo candida*, biometrical and biological studies, 196.

Albumin, egg—

- firmness of, an inherited characteristic, 172.
- foams, factors affecting, Colo. 275.
- heat-denatured, refractivity, 437.
- injury, protective factor against, Wis. 560.
- thin and thick, foam volume and stability, U.S.D.A. 560.
- thin, formation, 521.
- transmission of light by, 521.

Alcohol—

- and gasoline mixtures as engine fuel, comparison, Idaho, 110, 114.
- industry byproducts, feeding to cattle, P.R. 233.
- production by tomatoes, 51.

Aleurocanthus zizyphi n.sp., description, 659.

Aleurolobus niloticus n.sp., description, 812.

Aleuroplatus cadabae n.sp., description, 659.

Aleurotrachelus alhagii n.sp., description, 812.

Aleurotrachelus citri n.sp., description, 812.

Alewife in Seneca Lake, life history and ecological relations, [N.Y.]Cornell 807.

Alfalfa—

- and timothy hay for dairy cows, Ohio 36, 96.
- bacterial wilt and winterkilling, Colo. 787.
- bacterial wilt, notes, Utah 347; Wyo. 635.
- bacterial wilt resistance, testing, 63, 492.
- bacterial wilt resistance, selection for, Idaho 60; U.S.D.A. 633.
- black stem disease, Ky. 60.
- breeding, N.J. 35; Nebr. 758; U.S.D.A. 605.
- certified seed production, rules and requirements for, N.J. 616.
- culture and management, Ohio 608.
- culture experiments, Idaho 35; Wyo. 606.
- culture in Imperial Valley, Calif. 34.
- cutting experiments, 609; Calif. 606.
- diseases in Arizona, key, Ariz. 346.
- draft on soil moisture, Nebr. 758.
- effect of spring-burning natural mulch material, Iowa 757.
- effect on soil productivity, U.S.D.A. 759.
- fertilizer experiments, Wyo. 606.
- flea, bdellid mite predatory on, 221.
- flea in Australia, 220.
- flea, notes, 218.
- for hay, fertilizer experiments, Idaho 35.
- grass grown with, nitrogen uptake, 468.
- harvesting with windrow pick-up baler, Iowa 544, 846.

Alfalfa—Continued.

- hay, composition and vitamins in, Idaho 35.
- hay cut at different stages, vitamin A in, 235.
- hay, effect on milk flavor and milk fat, 524.
- hay for cattle fattening rations, Idaho 825.
- hay proteins, nutritive value, 523.
- hay, studies, U.S.D.A. 525.
- hay, successive cuttings, decomposition, 6.
- hay, vitamins in, effect of variety and curing, Colo. 757.
- Ladak, field trials, Wis. 488.
- leaf meal, effect on egg quality and hatchability, Mo. 514.
- leaf meal, nutritive value for chicks, N. Mex. 93.
- longevity and growth, effect of frequency-of-cutting, [N.Y.]Cornell 758.
- nitrogen in, effect of gypsum and sulfur, Idaho 13.
- on bacterial wilt-infected soil, Iowa 757.
- pasturing in Michigan, 762.
- pasturing with hogs, U.S.D.A. 827.
- pasturing with sheep, U.S.D.A. 826.
- root development, effect of clipping tops, 468.
- roots, invasion by *Sclerotinia* sp. and *Plenodomus meliloti*, 796.
- rotation experiments, U.S.D.A. 759.
- seed fields, blossom drop in, Idaho 74.
- seed production, 319, 666; Utah 359.
- seed quality, Colo. 757.
- seed screenings, feeding value, Idaho 97.
- seeds, weight for 1,000, Md. 45.
- silage, A.I.V., preparation and nutritive value, 524.
- snout beetle, studies, [N.Y.]Cornell 807.
- stands, duration, factors in, Ark. 756.
- stands, failure of, role of damping-off diseases, 492.
- studies, Utah 317.
- sweetclover, and red clover as soil-building crops, comparison, Iowa 743.
- treatment with gypsum and sulfur, Idaho 35.
- v. native hay for milk production, Wyo. 680.
- v. soybean hay for steers, Ky. 88.
- variability in, effect of inbreeding, 609.
- varieties and strains, testing for wilt resistance and resistance to freezing damage, Nebr. 788.
- varieties in United States, U.S.D.A. 319.
- varieties, reaction to stem blight, 350.
- variety tests, Fla. 316; Idaho 34; Iowa 757; N.J. 35; Nebr. 758; Utah 316; Wyo. 606.
- webworm, notes, 358.
- weevil in California, 368, 512.
- weevil, notes, 654; Utah 359.

Alfalfa—Continued.

- wilt, relation to *Bacterium insidiosum*, Iowa 787.
- wilt-resistant, breeding, Wis. 488.
- yellow, effect of delayed cutting, Wis. 502.
- yield, composition, and nutritive value, 234.

Alkali—

- accumulation in valleys, Utah 111.
- disease of livestock, field survey, U.S.D.A. 252.
- disease, relation to selenium, U.S.D.A. 690.
- soils, character and management, Iowa 743.
- soils, origin, 16.
- soils, reclamation, Idaho 13.
- soils, virgin black, reclamation, 301.

Allium hybrid, backcross population derived from, cytology, 753.

Alloionema appendiculatum dubia, n.var., notes, 214.

Alloys and metals, research on, 701.

Almond blossoms, infection by *Coryneum beijerinckii*, 633.

Almonds—

- breeding, Calif. 616.
- soil and cultural requirements, Calif. 46.

Alternaria dianthi on carnations, control, 630.

Aluminum—

- silicates, colloidal, mechanism of ionic exchange, Mo. 448.
- sulfate as used for damping-off, effect on pH of soil, 630.

Amaryllis, breeding improved varieties, Iowa 768.

Amazon fly, discovery and introduction, 510.

Amblyomma—

- cajennense*, transmission experiments with exanthematous typhus, 821.
- dissimile*, parthenogenetical reproduction, 514.

American—

- Dairy Science Association, meeting, papers, 101, 522.
- Farm Economic Association, meeting, papers and discussions, 853.
- Phytopathological Society, meeting, 431.
- Society of Agronomy, notes, 287.

America's capacity to consume, treatise, 710.

America's capacity to produce, treatise, 710.

Amino acid derivatives and serological inhibition tests, 437.

Amino acids—

- and proteins, combinations, 291.
- aromatic, synthesis by molds, 516.
- in soybeans, 5.
- in wheat flour, determination, 445.
- of various feeds, 526.

Ammonia, anhydrous, as fertilizer, 328.

Ammonium—

compounds, effect on soil and crop, N.J. 21.

sulfate, effect on soil and crop, N.J. 21.

sulfate, movement in soils, 591.

thiocyanate applications, effect on subsequent sowings of wheat, N.H. 475.

Amnicola limosa porata, host of *Prosthognimus macrorchis*, Minn. 392.

Amoeba spp., notes, 453.

Amoeboetania sphenoides, notes, 257.

Amorbia moth, life history and control, Calif. 654.

Amylase, malt, purification and properties, 442.

Amylase, salivary, inactivation by proteases, 294.

Amylases, plant, studies, 6.

Anabasin, physical properties, U.S.D.A. 502.

Anabrus simplex, see Cricket, Mormon.

Anacentrinus saccharidis, morphology and biology in Peru, 818.

Anadastus fucosus, biological studies, 218.

Anaerobes, cultivation, new apparatus for, 250.

Anaphothrips obscurus, see Grass thrips.

Anaplasma marginale, notes, 255.

Anaplasmosis—

diagnosis, complement fixation test for, 385.

in France, 257.

of cattle, Calif. 689; Fla. 385.

studies, Colo. 837; U.S.D.A. 528.

transmission experiments with British biting flies, 837.

treatment with novarsenobillon, 255.

Anarhopus sydneyensis, parasite of *Pseudococcus longispinus*, 370.

Anastatus—

spp., notes, 370.

viridicapus, notes, 370.

Anastrepha—

genus, table for separation of species, 664.

ludens, see Fruit fly, Mexican.

spp., eradication from island of Key West, U.S.D.A. 653.

spp., notes, P.R. 216.

spp., quarantine work with, U.S.D.A. 653.

Ancylostoma caninum, development, 688.

Anemia—

caused by deaminized casein, 892.

in foxes, due to fleas, 539.

in horses, etiology, pathology, and immunology, 535.

in lambs, Iowa 822; Wyo. 671.

iron-deficiency, diagnosis and treatment, 892.

nutritional, effect of metallic compounds for hemoglobin regeneration, 570.

nutritional, in cattle, economic importance, 370.

nutritional, in dairy calves, 523.

Anemia—Continued.

- of pregnancy in rats, Wis. 560.
- pernicious, liver for treatment of, 892.
- relation to gastrectomy, 892.

Anemias, treatment, 891.

Anemic tissues, respiratory studies, Wis. 560.

Aneurysm—

- brachial, in a Hereford steer, 104.
- rare case in portion of aorta of a horse, 250.

Angoumois grain moth in stored rice, control, 75.

Anguillulina—

- dipsaci* in narcissus plantings, weeds as carriers, U.S.D.A. 59.
- phyllobia* n.sp., infesting *Solanum elaeagnifolium*, 650.
- pratensis* on figs, 650.

Animal—

- breeding—see also Hybridization and specific animals.

and public health, relation to veterinary science, 249.

artificial, in Beltsville, U.S.D.A. 525.

in British Empire, 462.

diseases—see also specific diseases.

control by suppression of carriers. U.S.D.A. 500.

control, contributions by U. S. Department of Agriculture, U.S.D.A. 101.

diagnosis and control, U.S.D.A. 528.

in Bengal, 249.

in Cyprus, 529.

in Nevada, 528.

in Straits Settlements, 689.

in Tanganyika, 529.

in Trinidad, 382.

infectious, in Egypt, 530.

osteodystrophic, 102.

virus, intranuclear inclusions in, 381.

experiments, operative technic, 688.

fats, see Fats.

fibers, see Fibers.

husbandry in Northern Nigeria, problems, 516.

Industry, Bureau, Packers and Stockyards Division, data, U.S.D.A. 556.

nutrition, experimentation, methods, 670.

parasites, see Parasites.

pathology and bacteriology, Colo. 837.

pests, live trapping methods, 213.

products supply situation, Okla. 401.

tissues, nutritive value in growth, reproduction, and lactation, 722.

Animals—see also Cattle, Livestock, Mammals, Sheep, etc.

blood in, individuality, 463.

domestic, breeding and improvement, 311.

domestic, growth and development, Mo. 85, 823.

Animals—Continued.

experimental, ocular disturbances produced by dietary changes, 726.

fur-bearing, care and raising, 236.

game, identification of parts, Oreg. 73.

harmless, predator-trap device as safeguard, U.S.D.A. 72.

herbivorous, enterotoxaemia in, 250.

inheritance of resistance to bacterial infections, 381.

laboratory, resistance and susceptibility to disease in, Iowa 843.

magnesium deficiency in, 876.

poisoning as control method, U.S.D.A. 500.

standing and lying, energy difference, Mo. 515.

unbred virgin, significance of low agglutination reactions in, Mo. 528.

virgin, milk secretion after injections of pituitary hormone, U.S.D.A. 95.

vitamin requirements, N.J. 88.

wild and domestic, interrelation of parasites, Wyo. 689.

wild, in and out of the Zoo, 650.

Anion exchange, 162, 451.

Anomala orientalis, see Asiatic beetle.

Anomaloctenus, new genus erection, 820.

Anomis impasta, notes, 75.

Anopheles—see also Malaria and Mosquitoes.

maculipennis, digestion of blood and maturation of eggs after hibernation, 216.

maculipennis, guide to varieties, 814.

Anopelini, Philippine species, synonymic list, 814.

Antestia on coffee in Kenya, control, 811.

Anthelmintics, dips, and disinfectants, U.S.D.A. 528.

Anthelmintics, efficiency, effect of prior starvation, 382.

Anthrenomus—

eugenii, see Pepper weevil.

grandis, see Bollweevil.

grandis thurberiae, see Thurberia weevil.

musculus, see Cranberry weevil.

quadrigibbus, see Apple curculio.

Anthrax—

control, U.S.D.A. 528.

immunization with saponified culture, 530.

summary, U.S.D.A. 837.

symptomatic, see Blackleg.

Antineuritic vitamin, see Vitamin B (B₁).

Antirachitic, see Rickets and Vitamin D.

Antiscorbutic, see Scurvy and Vitamin C.

Ants—

control, P.R. 216.

in pineapple fields, biology and distribution, [Hawaii] Pineapple Producers' 84.

mound-building, simplified control in forests, 819.

Ants—Continued.

protection of seeds and plant cuttings against, 808.

white, *see* Termites.

Antuitrin G administered to pregnant rats, effect on weight of offspring, 314.

Antuitrin S, effect on infertile rabbits, 465.

Anuraphis roscus, *see* Apple aphid, rosy.

Aphanomyces root rot of peas, control, N.J. 60.

Aphanomyces root rot of peas, relation to soil fertility, 632.

Aphelenchoides parietinus, notes, S.C. 789.

Aphelenchus spp., new host plants, 803.

Aphelinus mali, development of a colony, 232.

Aphidae of Colorado, synopsis, 659.

Aphids—

new, from Gainesville, Fla. 812.

notes, Fla. 358.

woolly, *see* Apple aphid, woolly.

Aphis—

bituberculata, notes, U.S.D.A. 653.

brassicæ, *see* Cabbage aphid.

gossypii, vector of celery virus, 639.

maidis, *see* Corn leaf aphid.

persicæ, *see* Peach aphid, green.

rumicis, *see* Bean aphid.

spiraecola, notes, Fla. 358.

Aphodius sp. on tomatoes, 218.

Aphytis chrysomphali, life history, 660.

Apiculture, *see* Beekeeping.

Apioportha, description, synonymy, hosts, and distribution, 489.

Aplanobacter—

insidiosum, inability to enter alfalfa seedlings without wounds, 638.

stewartii, notes, N.J. 60; U.S.D.A. 195.

Apocynum sibiricum—

flowering and fruiting, 174.

morphology and biology, 174.

propagating by seeds, 174.

Apocynum spp. in Eurasia, 598.

Apparatus—

and methods for determination of energy in ultraviolet region of sunlight, 423.

auto-irrigator, improvements in, 25.

dipping, for treating corrugated paper bands for codling moth control, 80.

for burning sulfur, U.S.D.A. 653.

for determining rate of carbon dioxide production during yeast fermentation, 294.

for displacement of soil solubles, 299.

for laboratory demonstration of photosynthetic and respiratory ratios, 593.

for measuring aqueous vapor pressure of soils, 449.

for measuring resistance of citrus fruits to pressure, 781.

for rapid ultrafiltration, 156.

for recording appendicular or locomotor activity of insects, 215.

for studying effect of increased atmospheric pressure on developing eggs, 679.

Apparatus—Continued.

for vitamin purification, 584.

microburette, description, 446.

new photometer adapted to botanical purposes, 593.

pressometer for pressing fluid from cooked meat, 132.

proofing cabinet, modified, 867.

stainless steel high-pressure ultrafiltration, 155.

Apple—

aphid, rosy, notes, N.Y.State 654.

aphid, woolly, in Tennessee, 78.

aphid, woolly, parasite, development of a colony, 232.

bitter rot, notes, 802.

black pox, notes, W.Va. 635.

black rot, spray materials for, Nebr. 788.

bud mutations, cross-pollination trials, 774.

canker, relation to growth cycle and nutrition, 632.

curculio, notes, N.Y.State 654.

curculio, western, parasites in Kansas, 512.

cuttings, propagation, value of etiolation in, U.S.D.A. 616.

fire blight, control in the bloom, 209; [N.Y.]Cornell 788.

fire blight, relation of growth status of tree, N.J. 209.

fire blight resistance, 209.

fire blight, use of bordeaux mixture for, 354; Ark. 787.

fruit moth, summary, 510.

hairy root and crown gall, N.Y.State 635.

insects in eastern New York, N.Y.State 654.

juice concentrate, studies, 587; N.Y. State 581.

juice, effect of light, 133.

juice, preservation, U.S.D.A. 436.

juice, sterilization, Iowa 894.

leaf hopper, Australian, notes, 362.

leaf hopper, white, notes, N.Y.State 654.

leaf rust, percentage of infection, U.S.D.A. 346.

leaf variation, unusual, 335.

leaves, CO₂ assimilation, effect of air supplied, 335.

leaves, intercellular spaces, comparison, 335.

maggot, bionomics and control, Iowa 806.

maggot, control, 230; Conn.[New Haven] 429; N.J. 74.

measles, papular type, fruit spot associated with, 629.

moth, light brown, in Australia, 509.

nursery stock, hairy root, crown gall, and wound overgrowth, seasonal development, 621

orchard, nitrogen applications, N.H. 336.

Apple—Continued.

- orchards, soil management systems, Iowa 768.
- orchards, young, cover crops for, Ky. 47.
- pests, control project, 358.
- pollination, 337.
- pomace, galacturonic acid from, 152.
- root systems, development, Nebr. 769.
- root systems, effect of rootstock and soil, 334.
- sawfly, control, 233.
- scab ascospores, time of maturity, effect of soil type, N.J. 60.
- scab, control, 67, 209; Iowa 787; N.J. 60; N.Y.State 635.
- scab control, lime-sulfur and substitute fungicides for, [N.Y.]Cornell 788.
- scab control, spray program, improvement, Wis. 489.
- scab, lime-sulfur applications, evaluation, N.Y.State 635.
- scab on stored fruit, development, 630.
- scab, spray materials for, Nebr. 788.
- seeds after-ripening, effect of low temperatures, 478.
- shoot growth, analyzing by frequency curves, 477.
- shoots, alcohol-soluble matter in, seasonal changes, 775.
- soft scald and soggy break-down, 67.
- spot fungi, advance within host tissue, 645.
- thrips, notes, 218, 222.
- tissue, mineral elements in, determination, Mo. 476.
- tree growth and yield, effect of scab-preventive treatments, 630.
- tree root growth, method of observing, 334.
- tree, size, effect on relations of roots and stems, 334.
- trees, Baldwin, winter injury, relation to performance and nutritional treatment, N.Y.State 336.
- trees, carbohydrate storage in, 619.
- trees, disbudding in nursery row, Ark. 768.
- trees, fertilizer response on acid soil, N.Y.State 335.
- trees, piece-root grafted, hairy root, crown gall, and other malformations, control, 631.
- trees, seasonal cycles of nitrogenous and carbohydrate materials, 479.
- trees, wedge graft for controlling overgrowths at union, 645.
- trees, young, growth distribution, 333.
- trees, young, relative absorption of N, P, and K, Mo. 476.
- understocks, 333; N.Y.State 773.
- understocks, root systems, 774.
- washing machines, heating wash water in, 265.
- wood, bound water in, relation to hardiness, Iowa 769.

Apples—

- ammonia and nitrate nutrition, effect of temperature, N.J. 47.
- Baldwin, carbon dioxide assimilation of leaves on different sides of tree, 618.
- Baldwin, yield, relation to leaf weight per spur, 776.
- Baldwin, yield variations, causes, 775.
- biennial bearing, 619; U.S.D.A. 616.
- blue mold decay of, control, Wash. 354.
- blue mold infection, prevention, Wash. 67.
- breeding, Idaho 46; Iowa 769; Ohio 47.
- canned, vitamin C in, 421.
- chromosome number and behavior, and pollen tube development, Ark. 768.
- coloring, nature and causes, W.Va. 617.
- composition and keeping qualities, effect of nitrates, Iowa 769.
- cull, causes, Mo. 776.
- cultivated, chromosome number, 169.
- culture, Ky. 47; Nebr. 769.
- cytology, N.Y.State 617.
- Delicious, flowering and fruiting habit, Ohio 47.
- Delicious, training and pruning, W.Va. 617.
- during storage, loss of sugar and acid, relation to carbon dioxide output, 620.
- dwarfing stocks, Iowa 768.
- effect of potassium-carrying fertilizers, 185.
- fertilizer experiments, 335; Idaho 46.
- for north Georgia, Ga. 774.
- fruit bud formation, time for influencing, 775.
- fruit thinning, effects, U.S.D.A. 616.
- fruiting spurs, phyllotaxy, 479.
- fungicide-arsenical spray combinations for, 480.
- Grimes Golden and Jonathan, yellow pigment, U.S.D.A. 436.
- growing uniform stocks for propagation of standard varieties, Iowa 768.
- grown in Czechoslovakia, antiscorbutic potency compared with foreign fruits, 569.
- growth habits, N.J. 47.
- growth on various understocks, N.Y. State 617.
- hardy stocks for, 333.
- immature, abscission, nature of, Mo. 476.
- internal atmosphere, 620.
- iodized wraps for prevention of rotting, 773.
- Jonathan, handling for storage, 337.
- keeping quality, relation to maturity, Idaho 46.
- marketing in better condition, 337.
- McIntosh, effect of defoliation on spur leaf area, 618.
- McIntosh, pollination, relation to weather, 186; N.H. 337.
- metabolism, effects of humidity, 48.

Apples—Continued.

- metaxenia in, 311; Mo. 476; N.Y.State 617.
- nutritive value, 880.
- packed in barrels, effect of methods of packing, 620.
- penetration, distribution, and effect of petroleum oils, 498.
- physiology, 620.
- pollination, 187, 618, 774.
- pollination and fruit setting, Ohio 47.
- pollination and sterility studies, S.C. 769.
- pollination, effect of spraying during bloom, 187.
- prices and index numbers, Mich. 124.
- production, fertilizers as related to leaf area, 186.
- profits per acre from different types of soils, [N.Y.]Cornell 855.
- propagation, Iowa 768, 769.
- pruning, Ark. 768; Nebr. 769; Ohio 47.
- refrigeration of packages, factors affecting, Ill. 776.
- retention of carbon dioxide gas in intercellular atmosphere, 479.
- ripe, substance exuded by, effect on seedlings, 621.
- root distribution, Ark. 768.
- scion rooting, 332.
- selection of understocks for, W.Va. 617.
- small size, during 1933 season, cause, 334.
- spray residue removal from, 188; [N.Y.]Cornell 52; U.S.D.A. 616.
- spraying experiments for prevention of fruit set, 187.
- spraying in Tennessee, 346.
- Stayman Winesap, fruit splitting, causes, W.Va. 617.
- stock influence, parts played by root and stem in, 333.
- storage behavior, effect of nitrogen fertilization and storage temperature, 620.
- storages for, natural and cool air, Iowa 769.
- stored, carbohydrate content, effect of ethylene and ultraviolet treatment, 188.
- stored, chemical change and rate of respiration in, 337.
- sweet Jonathan bud sport, 336.
- thinning, Ohio 47.
- triploid, gamete and zygote sterility in, 753.
- understocks for, Nebr. 769.
- United States standard grades, cost of production, Pa. 776.
- varieties, new in Russia, 773.
- varieties on seedling and scion roots, circumferential variability, 479.
- varieties, progressive change in, N.Y. State 336.
- varieties, responses to different storage temperatures, Iowa 769.

Apples—Continued.

- varieties, sales methods and relative prices, [N.Y.]Cornell 855.
- variety tests, Iowa 769; Ky. 47; Ohio 47; Utah 327.
- vitamin C in, effect of storage in frozen state, 421.
- vitamins in, 880.
- washing, cost and efficiency, Ind. 47.
- waxlike coating, U.S.D.A. 436.
- winter injury of 1933-34, N.Y.State 333.
- winter stem pruning, effect on stem and root development, 334.
- worminess in, effect of color on, 360.
- xenia and metaxenia in, 462.
- Yellow Bellflower and Kasseler Reigette, period of fruit bud differentiation, 775.
- Yellow Newtown, fruit thinning and biennial bearing, 619.
- York Imperial, terminal growth and production, 618.
- Apricot *Monilia*, control in Vaucluse, 645.
- Apricots—
 - spraying for control of *Coryneum*, 645.
 - varieties, Utah 622.
 - varieties, new, in Russia, 773.
 - variety tests, Utah 327.
- Aqueous humor of ox eyes, antiscorbutic action, 732.
- Arachnophaga albolinea*, notes, 370.
- Araccerus fasciculatus*, see Coffee bean weevil.
- Architecture, landscape, classified bibliography, 192.
- Arginine determination, Sakaguchi reaction in, 9.
- Argyresthia conjugella*, see Apple fruit moth.
- Argyrotaenia citrana*, damaging green oranges in southern California, 364.
- Arizona Station, notes, 143.
- Arizona University, notes, 143.
- Arkansas Station, report, 894.
- Armadillidium vulgare*, notes, 229.
- Armadillo, food of, U.S.D.A. 500.
- Armillaria mellea*—
 - enzymes of rhizomorphs, 803.
 - survey, 633.
- Arrow root tests, P.R. 174.
- Arrowgrass, losses of cattle in North Dakota due to, 255.
- Arsenic—
 - in foods, naturally occurring, toxicity, 878.
 - in soils, 452.
 - white, for control of grubs, 359.
- Arsenical—
 - and lead residue problem, Idaho 74.
 - insecticides, effect on natural control of white flies on oranges, 220.
 - sprays, substitutes for, Mo. 501.
 - sprays, zinc hydroxide substitute for calcium hydroxide in, 630.
- Arsenicals, studies, U.S.D.A. 653.

- Arthropods, relation to animal diseases, 530.
- Artichoke plume moth, notes, 360.
- Artichokes—*see also* Jerusalem-artichoke.
soil and cultural requirements, Calif. 46.
- Artigasia* new genus, studies, 214.
- Ascarid roundworms of dogs, effect of ultra-violet radiation on ova, 843.
- Ascaridia lineata*, resistant and susceptible strains of chickens to, 688.
- Ascarids, differentiation, 103.
- Ascia rapae*, *see* Cabbage worm, imported.
- Ascochyta*—
blight on peas, U.S.D.A. 640.
rabiei, notes, 200.
spot of peas, symptoms, 789.
- Ascodesmis nigricans*, fertilization in, 598.
- Ascomycetes, sexuality in, 598.
- Ascorbic acid—
and intoxications, 886.
and orange juice, antiscorbutic potency, comparison, 586.
and vitamin C, relation, 586.
dietary, human daily requirements, 886.
effect on gaseous metabolism in guinea pigs, 732.
formation of intercellular substance by, 885.
in vitreous humor of ox eye, 422.
methylglycosides of, 439.
separation of cysteine from, 443.
- Asiatic beetle—
biological control in Hawaii, Hawaii 816.
notes, U.S.D.A. 652.
- Asilidae from Texas, 229.
- Asparagus—
anatomy of plant, N.J. 47.
better types, breeding, Calif. 616.
breeding, N.J. 47.
caterpillar, life history and control, Fla. 813.
culture, Ga.Coastal Plain 768; Iowa 769.
fern blight or rust, Fla. 346.
fertilizer experiments, Ga.Coastal Plain 768; [N.Y.]Cornell 770.
miner, appearance in England, 510.
production, factors in, Nebr., 769.
rust, summary, 800.
soil and cultural requirements, Calif. 46.
tenderness, seasonal variation in, 328.
variety tests, Ga.Coastal Plain 768.
- Aspen competition in Norway pine plantation, release from, 786.
- Aspergillus*—
fischeri single spore cultures, variation in, 460.
flavus, spore germination, Iowa 787.
niger and related forms and races, 460.
niger, hetero-auxin isolation from, 597.
- Aspidiotus destructor*, control, 656.
- Aspidiotus perniciosus*, *see* San Jose scale.
- Association of Land-Grant Colleges and Universities—
convention, agricultural research at, 145.
convention, editorial, 1.
convention, proceedings, 129.
notes, 896.
officers elected, 4, 143.
- Aster—
and celery yellows virus, transmission experiments with leaf hoppers, Calif. 647.
rust, control, [N.Y.]Cornell 788.
wilt, relation to *Fusarium* strains, 631.
yellows of California, transmission to potatoes, Calif. 647.
yellows virus from several States, experiments, Calif. 647.
yellows virus, natural infection of ornamental flowering plants with, Calif. 348.
- Asters, China—
stem cankers, 631.
wilt-resistant, relative susceptibility to other diseases, Wis. 489.
- Aucuba mosaic virus in isolated root tips, cultivation, 642.
- Aujeszky's disease, *see* Paralysis, infectious bulbar.
- Autographa brassicae*, *see* Cabbage looper.
- Auxin in growing tobacco leaf, distribution, 593.
- Auxin, pea test method for, 457.
- Avena sativa* and *A. fatua*, hybridization, relation to origin of fatuoids, 599.
- Avitaminosis—*see also* different vitamins.
A evolution, effect of nature and quantity of protein in diet, 883.
- Avocado—
brown mite, life history and control, Calif. 654.
fruit spot, U.S.D.A. 633.
oil, sterol content and vitamin value, Hawaii 413.
sun blotch, Calif. 634.
- Avocados—
alternate bearing, overcoming, 779.
fractional embryo graftage, 779.
production in Florida, Fla. 779.
propagation, 483.
varieties, Fla. 327.
variety tests, P.R. 182.
- Azalea leaf scorch, control, N.J. 60.
- Azotobacter*—
activity in Palouse silt loam, 163.
plaque test for soil deficiency, 455.
strain variation in, U.S.D.A. 448.
- Babesiella felis* n.sp. in the puma, 530.
- Babesiellases, gonacrine for treatment, 694.
- Baby beef, *see* Cattle, baby beef.
- Bacillus*—
abortus, *see* *Brucella abortus* and *Abortion*.
aertrycke, notes, 698.

Bacillus—Continued.

alvei and *B. para-alvei*, notes, U.S.D.A. 652.

enteritidis, see *Salmonella enteritidis*.
mycoides, variant forms of, symbiosis as factor, 597.

necrophorus, twelve strains, and oxygen intolerance, 250.

nigrificans n.sp., cause of pickle blackening, Mich. 158.

of Danitch carried by gray rats, 690.

paludis, notes, 106.

paratyphi, pleomorphism, 102.

paratyphosus B and C, notes, 698.

radicicola, see Legumes, inoculation, and Nodule formation.

typhi murium, notes, 886.

welchii, notes, 694.

Bacteria—

anaerobic, see Anaerobes.

carotene in, 460.

green-fluorescent, pathogenic to plants, [N.Y.]Cornell 195.

heat resistant and heat loving, control in pasteurizing plants, 243.

in milk, soil, etc., see Milk, Soil, etc. pleomorphism, 102.

rain-borne, role in fire blight spread, Wis. 489.

soft-rot, studies, 631.

Bacteriological chemistry, Iowa Station researches in, Iowa 739.

Bacteriology textbook, 381.

Bacterium—

abortus, see *Brucella abortus* and Abortion.

citri, see Citrus canker.

dissolvens, notes, U.S.D.A. 195.

enteritidis, notes, 698.

gypsophilae n.sp., description, 59.

insidiosum biology, relation to alfalfa wilt, Iowa 787.

malvacearum, notes, 351; Ark. 786.

marginatum, notes, 648.

pisi, notes, U.S.D.A. 640.

pruni, notes, Iowa 787.

pruni on English Morello cherry, 646.

pullorum, see *Salmonella pullorum* and Pullorum disease.

radicicola, see Legumes, inoculation, and Nodule formation.

savastanoi, knot production on Oleaceae cuttings by, 632.

solanacearum, notes, 207; P.R. 195.

solanacearum on potatoes and related plants, Fla. 346.

tabacum, pathogenicity and host range, 630.

tularensis, characteristics in organism discovered in Tunisia, 691.

tumefaciens, filterable stage, 632.

vesicatorium, notes, Ga. 801.

welchii, see *Clostridium welchii*.

Bagasse, production of a form of cellulose from, P.R. 150.

Bahia grass, growth behavior and effect of fertilizer, Fla. 316.

Baking, laboratory, standardization, 867.

Baking tests, modified proofing cabinet for, 719, 867.

Bamboo, studies, 467.

Banana—

disease produced by celery virus, 647.

root borer, control, 655, 808; P.R. 666.

root borer, notes, P.R. 216.

thrips, control, 222.

Bananas—

breeding principles, 170.

chromosomes of, 755.

feeding value, Hawaii 371.

variety tests, P.R. 182.

vitamin C in, compared with apples of Czechoslovakia, 569.

Banking, country, need of fundamental change in methods, U.S.D.A. 118.

Barberry eradication, U.S.D.A. 634.

Barium fluosilicate injury to dahlia flowers, 358.

Bark beetles and blue-staining fungi in felled Norway pine timber, interrelation, 211.

Bark beetles on southern pine, effect of blue-stain fungi, 665.

Barley—

as pasture crop, 319.

basal glume rot, 630.

breeding, Calif. 606; Iowa 757; Mo. 466; N.J. 35; [N.Y.]Cornell 758; U.S.D.A. 605.

certified seed production, rules and requirements for, N.J., 616.

composition, relation to grading, 35.
crosses, reaction to covered smut, inheritance, 792.

culture experiments, 35; Wyo. 606.

culture for malt and feed, U.S.D.A. 37.

culture in Imperial Valley, Calif. 34.

diseases, control by seed treatment, U.S.D.A. 200.

diseases in Arizona, key, Ariz. 346.

effect of artificial injury, Iowa 757.

feeding value, Idaho 825.

fertilizer experiments, 35.

foot rot disease, U.S.D.A. 791.

for fattening hogs, S.C. 823.

for pigs, value, effect of method of preparation, Nebr. 822.

germinated, amylase of, velocity of hydrolysis by, 6.

kernels, dehulling with sulfuric acid, 792.

leaf spots, nonparasitic, 491.

linkage studies, Colo. 757.

mildew, infection and injury, 792.

prices and index numbers, Mich. 124.

quality, effects of nutrients and soil conditions, Calif. 606.

quality, factors affecting, 35.

rotation experiments, U.S.D.A. 759.

scab, resistance to, U.S.D.A. 633.

scabbed, normal barley, and yellow corn, comparison for pullets, U.S.D.A. 237.

scald, symptoms, 789.

Barley—Continued.

- seed infections and treatment, Iowa 788.
- seeding tests, W.Va. 606.
- smut control and certified seed, N.Y. State. 639.
- statistics for California, Calif. 410.
- stripe disease, seed treatment for, Calif. 634.
- v. sugarcane molasses for pigs, Hawaii 371.
- varieties, Mich. 174.
- variety-cultural experiments, Iowa 757.
- variety tests, Ark. 756; Ga.Coastal Plain 757; Idaho 34; Ind. 35; Iowa 757; Nebr. 758; N.J. 35; Mo. 466; U.S.D.A. 605, 759; Utah 316; W.Va. 606; Wyo. 606.
- vitamin A deficiency for swine, Calif. 671.
- yarovization, 593.
- yield in fifty-sixth year of continuous culture, 36.
- yields, Ind. 35.

Barns—

- dairy contamination with streptococci, Mich. 533.
- milking, new arrangements and rotor-lactor, 241.

Bartonella bovis n.sp., description, 254.

Bartonella sergenti, new blood parasite of calf, 387.

Base exchange studies on Pennsylvania Jordan field plats, 454.

Basisporium ear and seed rot, inheritance of resistance to, Iowa 787.

Basisporium gallarum, pathogenicity to corn, Iowa 788; U.S.D.A. 633.

Bass, black grub, life history, 688.

Basswood *Nectria* canker, 632; [N.Y.] Cornell 788.

Batteries for laying and breeding stock, Hawaii 371.

Bean—

- aphid, organic thiocyanogen compounds for, 503.
- bacterial halo blight and wilt, Nebr. 788.
- beetle, Mexican—
 - control, W.Va. 655.
 - effect of derris, N.Y.State 360.
 - in Vermont, 665.
 - studies, S.C. 807; U.S.D.A. 653.
- Fusarium* yellows, seed transmission, 632.
- halo blight, notes, U.S.D.A. 633.
- leaflets, detached, growing powdery mildew on and breeding for resistance, 632.
- mosaic, N.Y.State 635.
- mosaic resistance in Great Northern beans, 63.
- mosaic, seed transmission, 631.
- mosaic, studies, Wis. 489.
- mosaic, tolerance, U.S.D.A. 633.

Bean—Continued.

- mosaic virus, transmission by insects, 632.
 - pod borer, lima, notes, P.R. 216.
 - pod borer, lima, on wild hosts in Puerto Rico, 655.
 - powdery mildew, notes, S.C. 789; U.S.D.A. 633.
 - root rot, cause and effect of fertilizers, S.C. 789.
 - rust resistance, nature, 632.
 - seed treatment for damping-off, S.C. 789.
 - seeds, germinating, black spot of, 353.
 - straw for lambs, Wyo. 671.
- Beans—*see also* Mung beans, Soybeans, Velvetbeans, etc.
- breeding, Calif. 616; [N.Y.] Cornell 770; S.C. 769.
 - breeding for disease resistance, Idaho 60.
 - chlorophyll deficiency in, hereditary, 462.
 - cotyledonary buds, development, [N.Y.] Cornell 307.
 - culture in Imperial Valley, Calif. 34.
 - fertilizer experiments, S.C. 769.
 - for seed, variety tests, Wyo. 606.
 - Fordhook lima, factors affecting yield, S.C. 769.
 - kidney, improvement, Mich. 175.
- lima—
- anthracnose, 345.
 - blossom drop and set of pods in, 183.
 - culture and fertilizers, [N.Y.] Cornell 477.
 - culture experiments, Ga.Coastal Plain 768.
 - fertilizer experiments, Ga.Coastal Plain 768; P.R. 182.
 - Henderson's bush, fruiting habit, Ohio 48.
 - oedema on, U.S.D.A. 195.
 - type, thresher and mechanical injury to seed, Calif. 115.
 - variety tests, Ga.Coastal Plain 768.
- prices and index numbers, Mich. 124.
 - Refugee type canning, immune to mosaic, Wis. 489.
 - snap and lima, yield, effect of planting distances, 183.
 - snap, culture experiments, Ga.Coastal Plain 768.
 - snap, fertilizer experiments, Ga.Coastal Plain 768.
 - snap, machine placement of fertilizers, 770.
 - snap, variety tests, Ga.Coastal Plain 768.
 - spacing and cultivation tests, [N.Y.] Cornell 758.
 - string, New York market prices, N.J. 124.
 - string, storage, 52.

Beans—Continued.

- susceptibility to mosaic diseases of white clover, alfalfa, and peas, U.S.D.A. 633.
- time of planting, S.C. 769.
- varieties, Iowa 769.
- variety tests, U.S.D.A. 759; Utah 316; Wis. 477.
- yellowing, Fla. 347.
- yields, Utah 327.

Bears, brown, of Admiralty Island, Alaska, management, U.S.D.A. 804.

Beauveria bassiana, field experiments with, 508.

Beaver and deer transplantings, U.S.D.A. 500.

Bedbugs, studies in Great Britain, 659.

Bee Culture Field Laboratory, Intermountain States, work at, Wyo. 655.

Bee diseases, 666.

Bee dysentery, cause, Wis. 502.

Beech—

- bark disease, role of beech scale and *Nectria coccinea*, 659.
- scale, life history, distribution, and pathogenic role, 660.

Beef—see also Cattle, beef.

- chilled, experimental shipment to Britain, 715.
- color, effect of grass, W.Va. 671.
- cooked, tenderness and juiciness, 866.
- liver, alcohol-extracted, nutritive value, 722.
- muscle, heated, press fluid from, 132.
- muscle v. pork muscle in canned dried form as chief source of protein, Iowa 866.
- prices in Canada, significance of demand, 715.
- production and quality, effect of cross breeding, U.S.D.A. 90.
- roasting, Mo. 560.
- scrap, value for egg production, Mo. 514.
- thermal properties, 130.

Beekeeping—

- in Nevada, report, 819.
- in Tanganyika, 655.
- in Uganda, 655.
- manual, N.J. 84.
- notes, 358.
- papers on, 666.

Beer, ingredients, manufacture, and standards, Conn.[New Haven] 130.

Bees—

- activities, effect of temperature, [N.Y.] Cornell 807.
- brood diseases, 819.
- foulbrood, see Foulbrood.
- importance of selection of stock, U.S. D.A. 84.
- nitrogen content, changes in, 83.
- queen and package, cost of production in California, Calif. 405.
- queen, egg-laying activities, temperature gradient in, 666.

Bees—Continued.

- queen, number of egg tubules in, variation, 513.
- racas and stock replacement, Iowa 806.
- relation to fire blight, 498, 631, 654.
- saprophytic fungi associated with, 513.
- studies, N.J. 74.
- toxicity experiments, methods and results, 369.
- visits, relation to nectar concentration in blossoms, 368.
- wintering, Wyo. 655.
- worker, sacrifice of life when stinging, 369.

Beet—

- army worm, life history and control, 813.
- army worm on *Asparagus plumosus*, Fla. 358.
- byproducts for fattening lambs, Wyo. 671.
- curly top resistenes, U.S.D.A. 633.
- leaf hopper, birds as predators, 501.
- leaf hopper, control by spraying wild host plants, U.S.D.A. 74.
- leaf hopper, notes, Idaho 74; Mont. 807.
- leaf hopper, number of generations under natural conditions, 362.
- leaf hopper, studies, U.S.D.A. 653; Utah 359.
- pulp, dried, feeding value, 675.
- pulp v. pineapple bran as source of succulence for dairy cows, N.J. 95.
- seed treatment against black root rot, N.J. 60.
- tops, pasturing with sheep, U.S.D.A. 826.
- webworm, notes, Mont. 807.

Beetles of New Zealand and their larvae, 666.

Beets—

- chickrowing, development of equipment for, Iowa 846.
- culture and fertilizers, [N.Y.] Cornell 477.
- culture in Imperial Valley, Calif. 34.
- field or fodder, see Mangels.
- growth, effect of soil type, acidity, and organic matter, 184.
- self-fertility and self-sterility in, 751.
- stock, culture experiments, Utah 316.
- sugar, see Sugar beets.
- table, internal root color in, index, 184.
- variety tests, Wis. 477.

Bella moth, studies, Fla. 358; S.C. 807.

Belle Fourche Field Station, work, 894.

Belts and pulleys on the farm, 115.

Beltsville laboratory, physiological research, U.S.D.A. 463.

Bemisia longispina n.sp., description, 659.

Bentgrass—

- Colonial, utilization of nutrients, N.J. 26.
- covered smut in Oregon, U.S.D.A. 488.

Bentgrass—Continued.

- Rhode Island Colonial, seed yields, effect of fertilizers, 610.
 velvet, breeding, N.J. 35.
 Bermuda grass and carpet grass, chemical analysis, comparison, S.C. 831.
 Bermuda pasture, grazing tests and returns, S.C. 831.
 Berries, see Fruits, small, and Raspberries, Strawberries, etc.

Bibliography of—

- agricultural economic literature, 854.
 agriculture, tropical, 142.
 alfalfa culture, 609.
 anaplasmosis in France, 257.
 apple curculio, western, 513.
 bedbugs, 659.
 bees, toxicity experiments, 369.
 beetles, self-fertility and self-sterility in, 751.
 birds of Hawaii, exotic, 356.
Brucella abortus infection of swine in packing-house, 841.
Brucella in man and animals, 383.
 bumblebees, 369.
 butter, unsalted, cheeselike flavors in, Minn. 380.
 carrion, insect inhabitants, 658.
 cattle, horned, blood picture, 692.
 cell wall structure of plants, 749.
Cochliomyia and myiasis in tropical America, 815.
 coconut caterpillar, 662.
 Collembola of Iowa, 361.
 Dermaptera of Illinois, 658.
 derris, stored, coleopterous pests in Malaya, 817.
 devil's-shoestrings as source of rotenone, U.S.D.A. 504.
 diphtheria in man, relation to dermatitis of ruminants, 531.
 Diptera, aquatic, of North America, [N.Y.]Cornell 510.
 fluorine, effect on dogs, 690.
 forest seeds, importance of origin, 344.
 forest soils, organic, U.S.D.A. 745.
 fowl pest outbreak, 109.
 frogs and toads, 500.
 Fungi Imperfecti, 29.
 fungi of Venezuela, 460.
 grasshopper, migratory, important parasites of, 658.
 grasshoppers, Siberian, 361.
 hematology, 249.
 Hessian fly, U.S.D.A. 366.
 insect parasites and hosts, 360.
 lambs, stiff, [N.Y.]Cornell 107.
 land settlement, U.S.D.A. 403.
 land utilization in Minnesota, 549.
 landscape architecture, 192.
Lymantria, 813.
 malaria and Culicidae, 814.
 mastitis, 533.
 May beetles of Iowa, 230.
 micro-organisms, cytology, 837.

Bibliography of—Continued.

- naphthalene, use against Japanese beetle, U.S.D.A. 231.
 nematodes of sheep in Manawatu district, New Zealand, 841.
Nemeritis canescens, 232.
 nutrition, newer trends in, 866.
 oats, vernalization, 610.
 Orthoptera of Illinois, 658.
 pepper weevil, U.S.D.A. 512.
Phormia regina, early embryological development, 663.
 phototropism, insect, economic importance in India, 655.
 plant diseases, virus, 490, 790.
 protoplasm, structure, 749.
 pullorum disease, agglutination tests for, 260.
 pyrethrum as insecticide, 809.
 red scale, California, in Palestine, 660.
 refrigeration, 400.
 San Jose scale, menace to European fruit culture, 363.
Sminthurus viridis in Australia, 220.
Strongyloides ransomi, U.S.D.A. 695.
 tapeworms in fowls of Kansas, 258.
 tariff, 270.
 taste and chemical constitution, 870.
 teeth decay, cause, 733.
 thiocyanogen compounds, organic, as insecticides, 503.
 toads and frogs, 500.
 tree species of Rocky Mountain region, U.S.D.A. 57.
 tubercle bacillus, avian, in hogs, 838.
 vegetation in France, 159.
 vitamin B complex, new factors in, 419.
 vitamin D, 586.
 vitamin D, crystalline form, 155.
 weed control, chemical, N.Dak. 326.
 wood, digestion by insects, 500.
 Bile acids and sterols, ring system, 587.
 Bindweed control, Nebr. 45; Wyo. 606.
 Bindweed, tillage v. chlorates for control, cost and effectiveness, 475.
 Biological—
 fluids, magnesium in, determination, Kolthoff's colorimetric method, 445.
 products, standardization, 102.
 products, testing, U.S.D.A. 528.
 Bird pests, control, 358.
 Bird pox strains, comparative study, 258.
 Birds—
 as predators of beet leaf hopper, 501.
 fish-eating, parasites, Oreg. 73.
 game, artificial incubation, [N.Y.]Cornell 651.
 game, conditions in Maryland, 213.
 game, ecology, Iowa 804.
 game, food resources, U.S.D.A. 500.
 garden, food, habits, and appearances, 651.
 injuriously, field investigations, U.S.D.A. 500.
 Japanese, eggs of, 805.
 of Great Britain, parasites of, 514.

Birds—Continued.

- of Hawaii, exotic, 356.
- of the world, check list, 356.
- popular account, 650.
- protection, directory of officials for, U.S.D.A. 650.
- protection, principal legislative measures, 500.
- Birdsfoot trefoil in agriculture, 468.
- Biscirus lapidarius*, predatory on lucerne flea, 221.
- Bixa, variety tests, P.R. 182.
- Black beetle, control, 808.
- Black scale in Western Australia, 656.
- Black stem rust, prevention, U.S.D.A. 634.
- Blackberries—
 - culture and disease control, Ill. 778.
 - propagation by leaf bud cuttings, 341.
 - training, 341.
- Blackberry—
 - cane measurements, 340.
 - rosette disease, 346; La. 69.
- Blackbirds and orioles, 652.
- Blackhead—
 - in poultry, Nebr. 837.
 - in turkeys, Mo. 528.
- Blackleg—
 - in cattle, summary, Mont. 693.
 - vaccine, formalized, value, 250.
- Bladderstone formation, relation to nutrition, 570.
- Blaniulus guttulatus* on peas, 506.
- Blashtomycosis on pelvic bones of a horse, 249.
- Blatta orientalis*, see Cockroach, oriental.
- Blissus leucopterus*, see Chinch bug.
- Blister beetle, margined, toxicity of barium fluosulfate, 358.
- Blood—
 - acid-base equilibrium, possibility of producing a shift in, 723.
 - group incompatibility in rabbit embryos and in man, 312.
 - groups in fowls, inheritance, 603.
 - in higher animals, individuality of, 463.
 - iodine in, determination, 12, 157.
 - iron determination in, 445.
 - leucocytes, relation to lactation, 524.
 - lipids, concentration, effect of vitamin A deficiency, Ark. 883.
 - mineral composition, effect of inorganic salt intake, 824.
 - plasma of normal and anemic persons, iron in, 877.
 - phosphorus of chickens, 238.
 - pressure, effect of coffee caffeine and decaffeinated coffee, 873.
 - protein-free ultrafiltrates, rapid method for obtaining, 156.
 - proteins, determination by acid acetone, 11.
 - regeneration, see Hemoglobin formation.
 - serum, quick dry ashing method, 445.
 - small amounts, fatty acids from, determination, Ark. 739.

Blood—Continued.

- sugar curves after administration of fructose, mannose, and xylose, 724.
- Blowflies—
 - gustatory and olfactory organs, morphology, 663.
 - inhabitants of carrion, 657.
 - of sheep in Western Australia responsible for strike, 510.
 - of sheep, tests of baits treated with sodium sulfide, 510.
- Blowfly—
 - maggots, nutrition, 367.
 - sheep, effect of environment, 229.
 - strike, jetting for reduction, 815.
 - strike of sheep and weather stain in New South Wales, 229.
- Blue stain in pine timber, prevention, 650.
- Blueberries—
 - analysis for arsenic, Me. 414.
 - breeding, U.S.D.A. 616.
 - cultivation and fertilization, N.J. 47.
 - highbush, culture, Mich. 482.
 - native Maine, effect of fertilizers, 625.
 - variety tests, Ga.Coastal Plain 768.
- Blueberry stem borer, control, N.J. 74.
- Bluegrass—
 - competitive efficiency and productivity, 37.
 - Kentucky, seed tests for purity, Iowa 757.
 - Kentucky, utilization of nutrients, N.J. 26.
 - life history and self-fertility studies, Ky. 35.
 - pastures, management, Wis. 466.
 - seeds, weight for 1,000, Md. 45.
- Boarmia bistortata*, notes, 217.
- Boars, fertility and inheritance of cryptorchidism in, U.S.D.A. 463.
- Bobwhites, see Quail.
- Boiler corrosion, N.J. 110.
- Bollweevil—
 - control by arsenicals and parasites, U.S.D.A. 653.
 - control, calcium arsenate v. other insecticides, 82.
 - development on plants other than cotton, 82.
 - hibernation, S.C. 807.
 - history and control in Oklahoma, Okla. 818.
 - studies, S.C. 807.
- Bollworm—
 - control, U.S.D.A. 653.
 - control in S. Africa, 365.
 - pink, control, 653; P.R. 216.
 - pink, control by destroying wild cotton, U.S.D.A. 74.
 - pink, in Punjab, studies, 227.
 - 653.
 - pink, quarantine work with, U.S.D.A.
 - pink, survival, effect of soil moisture, 80.
 - red, control in S. Africa, 365.
- Bolts, resistance to corrosion, U.S.D.A. 699.

Bombardia lunata n.sp., genetic studies, 751.
Bombyx mori, see Silkworm.
 Bone meal and dicalcium phosphate as mineral supplements, relative value, [N.Y.] Cornell 830.
 Bone meal as mineral supplements to dairy ration, 375.
 Bone scrap, nutritive value for chicks, N.Mex. 93.
 Bones—
 chemical changes due to magnesium deprivation, 876.
 development and composition, effect of rations, 234.
 Books on—
 agriculture, first problems in, 130.
 America's capacity to consume, 710.
 America's capacity to produce, 710.
 bacteriology, 381.
 bumblebees and their ways, 369.
 citrus insects, control, 657.
 climatology, 446.
 color in the garden, 192.
 concrete curing, 702.
 dairy industry of New Zealand, 552.
 dairy science, fundamentals, 830.
 diet and personality, 279.
 diets at four levels of nutrition and cost, 869.
 dogs, 236, 536.
 economics of Pacific area, 269.
 economics with applications to agriculture, 401.
 embryology and genetics, 31.
 engineering, civil, 701.
 engines, internal-combustion, theory, analysis, and design, 399.
 entomological equipment and methods, 215.
 fabrics, industrial, 893.
 farm management, 401.
 food and health, 559.
 frogs and toads, 500.
 frogs, culture, commercial aspects, 213.
 gardening, 326.
 Gramineae, 467.
 health and food, 559.
 hematology, 249.
 horses, management, 373.
 ice cream manufacture, 381.
 meat inspection, 101.
 microbiology, 836.
 nematodes, plant parasitic, and diseases caused by, 212.
 nutrition, 865.
 plants, economic, 165.
 poultry production, 275.
 rusts in United States and Canada, 57.
 silviculture, theory and practice, 193.
 social investigation, technic, 272.
 sociology, rural, elements, 272.
 toads and frogs, 500.
 transportation, inland, principles, 713.
 vaccine and serum therapy, 689.
 veterinary helminthology and entomology, 528.

Books on—Continued.
 veterinary hygiene, 101.
 weather, 158.
 welding, electric, principles, 263.
Boophilus—
 annulatus, see Cattle tick.
 australis, repellent and killing effects of gordura grass on, 821.
 genus, taxonomy and morphology, 670.
 microplus, transmission experiments with exanthematous typhus, 821.
 Bordeaux mixture—
 dilute, for blotch, Brooks spot, and bitter rot, Ohio 47.
 effect on transpiration rate, Ohio 790.
 evidence of stimulation of potatoes, 631.
 for potatoes, copper-lime ratio, 629.
 for prevention of fire blight, Wis. 489.
 injurious effects on pecan trees, 649.
 made in different ways, comparison, W.Va. 635.
 notes, 631.
 transpiration rate, relative effect of calcium and magnesium, Ohio 197.
 transpirational response of plants to, Ohio 490.
 Boron—
 deficiency, effect on strawberries, 625.
 deficiency in tobacco, external and internal symptoms, 799.
 effect on calcium absorption, 305.
 injury from irrigation water, U.S.D.A. 634.
 tolerance of crops to, U.S.D.A. 634.
 Botanical—
 Congress, International, program, 288.
 nomenclature, international rules, 460.
 Botfly, sheep, cause of conjunctival ophthalmomyiasis, 688.
Botryosphaeria ribis, host range, 196.
Botrytis cinerea, notes, 630.
 Botulism, enzootic, among wild birds, 261.
 Boxelder—
 behavior, Nebr. 769.
 bug in New York, 501.
Brachycoma acriditorum, parasite of migratory grasshopper, 658.
Brachylaemus virginiana, new experimental hosts for, 652.
Brachymeria hammari, notes, 80.
Brachyrhinus ligustici, new alfalfa pest, U.S.D.A. 653.
Brachyrhinus sulcatus, see Vine weevil.
 black.
 Brachyury in mice, linkage of, 312.
Bracon tachardiae, developmental stages, 667.
 Braconids and hosts, 217.
 Brain tissue—
 respiratory quotient, effect of vitamin B₁, 730.
 surviving, of pigeons, maintenance of respiration in, 562.
 Brambles, fruit bud formation, 190.
Brassolis sophorae, bionomics, natural enemies, and control, 662.

Bread—*see also* Flour.

staling, U.S.D.A. 436.

Breeding, *see* Animal breeding. Plant breeding, and specific animals and plants.

Bremia lactucae, physiologic forms, 630.

Brevicoryne brassicae, *see* Cabbage aphid.

Brewery byproducts, feeding value, U.S.D.A. 88.

Brick masonry columns, reinforced, tests, 397.

Brick wallettes, permeability tests, 702.

Bricks and mortars, properties, relation to bond, 396.

Bridge—

arch model, temperature stresses, photoelastic determination, 702.

rigid frame concrete arch, analyses, U.S.D.A. 702.

Bridge-pier formulas, pile-trestle coefficients for, U.S.D.A. 541.

Broadbean bacterial blight in Louisiana, 631.

Broadbeans or horsebeans, monograph, 37.

Broccoli—

sprouting, production, N.Y.State 477.

uncooked, vitamins in, Wis. 560.

Bromegrass, spacing test, Utah, 317.

Bronchitis, infectious, *see* Laryngotracheitis.

Brontispa froggatti selebensis, biological control in Celebes, 817.

Brooks fruit spot, control, N.J. 60.

Broomcorn—

diseases in Arizona, key, Ariz. 346.

situation, Okla. 707.

Brown patch caused by *Sclerotium rhizodes*, 630.

Brown-tail moth—

parasites, U.S.D.A. 228.

quarantine work with, U.S.D.A. 653.

Brucella—

abortion—*see also* Abortion.

antigen, rapid-test, preservatives for, 532.

elimination with milk of carrier cows, 385.

from feces of calves taking infected milk, 384.

in milk from vaccinated herd, 384.

in milk, relation to agglutination value of cow, 839.

in serous effusion of hip-joint of a cow, 104.

in udder of cow, 532.

in uterine fluid and milk, and agglutinins in blood of ceased reactor cows, 532.

infection of swine in packing houses, 841.

infection, serum experiments in small animals, 690.

reinfection with, effect, 532.

suis, longevity, effect of environment, 838.

various fractions, 838.

group, electrophoretic mobilities, variations in, 102.

infections in animals and man, laboratory diagnosis, 382.

Brucella—Continued.

spp., differentiation, 690.

suis, organic lesions in swine caused by, 841.

Bruchus pisorum, *see* Pea weevil.

Brussels sprouts—

culture and fertilizers, [N.Y.]Cornell 477.

seedling growth, effect of soil sterilization with mercuric chloride, 770.

Bryophyllum crenatum leaves, hormonal nature of inhibiting effect of, 749.

Bubonic plague in East Indies, relation to rat fleas, 510.

Bucks, sheath necrosis in, cause and control, Idaho 102.

Buckwheat—

culture experiments, Fla. 316.

prices and index numbers, Mich. 124.

seedlings, effect of substance from ripe apples, 621.

Buffalo grass, reestablishing on cultivated land in Great Plains, U.S.D.A. 468.

Building purposes, use of Idaho materials for, Idaho 110.

Buildings, wind pressure on, 398.

Bulb fly, lesser, bordeaux-oil sprays as repellents, 80.

Bulb mite infestation of gladiolus, 506.

Bulb sterilizing solution against nematodes, U.S.D.A. 59.

Bulbs—

from seed, U.S.D.A. 55.

spring, forcing, U.S.D.A. 616.

Bull indexes, 31, 524; [N.Y.]Cornell 830.

Bulls—*see also* Sires.

purebred, improving size and quality of native cattle by use, Fla. 371.

transplanting gonadal tissue in, results, 33.

virility in, U.S.D.A. 463.

Bumblebees and their ways, treatise, 369.

Bunt, *see* Wheat smut, stinking.

Bureau of—

Agricultural Economics, general economic research, U.S.D.A. 707.

Agricultural Engineering, report, U.S.D.A. 699.

Animal Industry, Packers and Stockyards Division, data, U.S.D.A. 556.

Chemistry and Soils, researches, U.S.D.A. 436.

Business cycles and sun spots, relation, 740.

Butane—

as engine fuel, merits, 703.

for use in gas engines, Calif. 700.

Butter—

and cheese cultures, 241.

bacteriological defects, prevention, 242.

biological examination, microscope for, 524.

carotene and vitamin A in, effect of breed and diet of cows, 380.

churning, effect of triglycerides and fatty acids, N.J. 95.

composition, effect of type of container, Idaho 95.

Butter—Continued.

- consumption in Minneapolis, Minn. 714.
- creamery, improving quality, U.S.D.A. 525.
- creamery, manufacture in Alberta, 242.
- cultures, preparing for mail shipment, Iowa 830.
- flavors, 243.
- grading, 242.
- Hungarian, variations in, according to seasons, 835.
- irradiated ergosterol and cod-liver oil, antirachitic factor, differentiation, 685.
- keeping quality, relation to acidity of cream, 380.
- making, citric acid and sodium citrate in, 524.
- making, important factors in cream production for, U.S.D.A. 526.
- making, neutralization of cream for, 242.
- making, 93 score and prevention of waste, 241.
- manufacturing costs, survey, Iowa 830.
- microbiological analysis, methods, 376.
- microscopic examination, application, 241.
- prices and index numbers, Mich. 124.
- rancidity and surface taint in, organisms causing, Iowa 830.
- scores, research, 241.
- scorings, monthly, lessons from, 243.
- southern, fat constants, flavor, and texture, 375.
- sweet cream salted, changes in microbiological flora at 15° F. 527.
- unsalted, cheeselike flavors in, microbiology, 524; Minn. 380.
- Victorian salted, in cold storage, keeping quality, 526.
- vitamin D activity, 685.
- yield, effect of electric charge on fat globules, Wis. 526.

Butterfat—

- composition, relation to churnability of cream, 379.
- cost of production, Ky. 118.
- high vitamin A value, maintaining, 523.
- iodine number, relation to hardness of butter and butterfat, 380.
- percentage, effect of feeding, 682.
- percentage, high, inheritance in Holstein-Friesian cattle, N.J. 98.
- production of cows, effect of thyroidectomy and thyroid feeding, 98.
- seasonal variation in English butter, 685.
- susceptibility to oxidation, 524.
- vitamin A in, 523.

Buttermilk, dried—

- manufacture, composition, and use for feed, U.S.D.A. 832.
- v. dried skim milk for pigs, Wis. 515.

Butyric acid bacteria, stimulative substance for, additional sources, Wis. 436.

Cabbage—

- aphid, notes, Mont. 807.
- arsenical residue removal from, N.J. 52.
- breeding, [N.Y.]Cornell 770; S.C. 769.
- breeding for resistance to yellows, 639.
- clubroot organism, wound infection and tissue invasion by, 494.
- Copenhagen, new strain, description, La. 771.
- culture and fertilizers, [N.Y.]Cornell 477.
- culture experiments, Ga.Coastal Plain 768.
- effect of ammonium sulfate, N.J. 21.
- effect of copper, boron, iodine, bromine, and arsenic mixture, Ky. 47.
- fertilizer experiments, Ga.Coastal Plain 768.
- fertilizer requirements, Hawaii 327.
- insects, N.Y.State 654; S.C. 807.
- irrigation and shelter belt trials, Wyo. 617.
- looper, derris and pyrethrum dusts for, 228.
- maggot, notes, Mont. 807.
- response to manures and fertilizers, 184.
- response to nitrogen carriers, Ky. 47.
- savoy, New York market prices, N.J. 124.
- seed, hot water treatment, N.Y.State 617.
- soil and cultural requirements, Calif. 46.
- spacing experiments, S.C. 769.
- transplanting, 328.
- varieties, Hawaii 327.
- varieties, origin and development, Mich. 328.
- variety tests, Ga.Coastal Plain 768.
- worm, control, Wis. 502.
- worm, control, arsenical spray substitutes, Mo. 501.
- worm, imported, derris and pyrethrum dusts for, 228, 358.
- worm, imported, notes, Mont. 807.
- worm, imported, times of emergence and forms, 507.
- worms, effect of derris, N.Y.State 360.
- worms, notes, N.Y.State 654.
- yellows in Cuba, U.S.D.A. 195.
- yellows-resistant, development, Mo. 488; Wis. 489.
- yellows-resistant variety, breeding and selection, Iowa 787.

Cacao—

- beans, Trinidad, variation in size, 627.
- propagation by stem cuttings and by graftage, 54.
- seeds, viability after storage, 780.
- shells, vitamin D in, 888.

Cadelle in stored rice, control, 75.

Cadmium, toxicity to chewing insects, 656.

Caffeine, coffee, and decaffeinated coffee, effect on blood pressure and pulse rate, 873.

Cake, cracker, and pretzel manufacture, Pa. 868.

Calandra sp., toxicity tests, 666.

Calciferol, infrared absorption spectrum, 7.

Calcium—see also Lime.

absorbed, availability, Mo. 448.

absorption from nutrient solutions with and without boron, 305.

and vitamin D in foods, 888.

arsenate, response of soil types to, 315.

arsenate sprays, injury from, N.Y.State 581.

carbonate and magnesium carbonate, relative amounts in Minnesota subsols, 747.

carbonate as weevil control, 513.

chloride as forest fire retardant, 488.

content of pastures, [N.Y.]Cornell 758.

cyanamide, toxicity prevention, 591.

cyanide, use against cattle grubs and flies in milking barns, Mo. 501.

deficiency, relation to photosynthesis, translocation, and protein synthesis in plants, Mich. 750.

deposition in bones, relation to pH value of intestinal tract, Mo. 564.

excess, effect on growth and composition of rats, 417.

in rations of dairy cows, 375.

in sesame seed, U.S.D.A. 133, 560.

intake, effect on calcification of bones and teeth during fluorine toxicosis, 879.

losses from cultivation of forest land, 194.

metabolism in puppies deprived of parathyroid gland but treated with vitamin D, Wis. 559.

serum, in rats, relation to sex and age, 875.

sources for laying hens, S.Dak. 92.

sources for pigs in dry lot, Iowa 822.

utilization from calcium carbonate and calcium gluconate by chickens, 678.

Calendra oryza, see Rice weevil.

Calf meals, pellet form, value, Idaho 95.

Caliche, quality, determination, soil tests for, U.S.D.A. 702.

California—

Station, notes, 430.

Station, report, 735.

University, notes, 430.

Calla root rot, control, N.J. 60.

Calves—

beef, creep feeding v. pasture alone, La. 89.

beef, feeding, Mo. 514.

beef, wintering, Colo. 821.

carotene and vitamin A in nutrition, 523.

fattening, calcium-phosphorus ratio on rate and economy of gain, Utah 371.

fattening rations, 370; Iowa 821.

fed infected milk, *Brucella abortus* in feces, 384.

feeder, production, 370.

lethal muscle contracture in, hereditary, 170.

Calves—Continued.

ovarian development and reaction to gonadotrophic hormones, 523.

range, winter maintenance, Utah 371.

stomach, rate of evacuation, effect of fat in milk, 523.

veal, prices and index numbers, Mich. 124.

water requirements, Idaho 95.

wintering rations for, Nebr. 822.

Camellia, vegetative propagation, effect of media and maturity of wood, 782.

Camels, milk fat of, fatty acids and glycerides in, 440.

Canaries, spontaneous paratyphoid infection, 845.

Cancer susceptibility in mice, nature, 603.

Cane borers, notes, 655.

Cane fodder in lamb fattening rations, mineral supplements and grinding, Colo. 821.

Cane grubs, control by fumigation, 359.

Cane straw, production of a form of cellulose from, P.R. 150.

Canned foods, vitamins in, 888.

Canning—

crops, production, soil tests for land selection, 591.

crops, tests, N.Y.State 635.

crops, vegetable, rotation and fertilizer experiments, N.Y.State 617.

home, bacteriological problems in, 869.

Cantaloup, see Muskmelon.

Capillaria—

aerophila in foxes, 539.

bursata n.sp., description, 697.

parasitic in upper digestive tract of birds, 688.

Capillaries of skin, strength, determination, 422.

Capnodis tenebrionis, biology and control, 665.

Capsanthin in egg yolk, Ga. 94.

Carabidae of Sumatra, catalog, 367.

Carbohydrate—

metabolism, avian, studies, 562, 874.

metabolism, control, 279.

metabolism of normal and diseased potatoes, 205.

metabolism, role of copper in, 877.

tolerance, effect of gain in weight, 563.

Carbohydrates—

effect on evolution of experimental xerophthalmia, 883.

storage in apple trees, 619.

Carbon—

dioxide—

assimilation by apple leaves, factors affecting, 618, 619.

concentration in air, effect of wind, 588.

evolution in soil, 18.

formation by clean and scabby potatoes, 65.

from pea pods, 51.

in greenhouses, determination, 327.

- Carbon—Continued.
 dioxide—continued.
 in intercellular spaces of pears and apples, 479.
 production by manite-treated soils for measuring response to fertilizers, 747.
 production during yeast fermentation, determination, 294.
 nitrogen ratio, relation to soil classification, 161.
 tetrachloride, effect on appetite of sheep, 529.
 tetrachloride, toxicity for sheep, 105.
- Carborundum, use as abrasive in plant-virus inoculations, 633.
- Carboxide gas as fumigant for vessels, 360.
- Carnation—
 bacterial leaf spot, notes, [N.Y.]Cornell 788.
 disease control, 630.
- Carnations—
 breeding improved varieties, Iowa 768.
 greenhouse, culture, N.J. 47.
 growing, [N.Y.]Cornell 782.
- Carotene—
 and vitamin A in dairy feeds, 523.
 and vitamin A in nutrition of calves, 523.
 and vitamin A, relation, 280.
 in bacteria, 442, 460.
 in butter, effect of breed and diet of cows, 380.
 in butterfat, determination, 296.
 in English butter, seasonal variation in, 685.
 introduced into circulation, fate, 882.
 new properties, 418.
 preparations, biological activity, 882.
 transformation into vitamin A in human body, 882.
- Carotenes, synthesis by bacteria, Wis. 436.
- Carotenoid pigments—
 constitution, 279.
 relation to sexual reproduction in plants, 749.
- Carotenoids and vitamin A—
 cycle in vision, 280.
 relation to micro-organisms, 442, 460.
- Carpet beetles, studies, [N.Y.]Cornell 807.
- Carpet grass—
 and Bermuda grass, chemical analysis, comparison, S.C. 831.
 ash constituents, relation to oxidation-reduction potentials of metallic nutrients, 315.
 growth and composition, effect of basic slag and superphosphate, S.C. 759.
 preparing cut-over coastal land for seeding to, S.C. 759.
- Carpocapsa pomonella*, see Codling moth.
- Carpophilus hemipterus*, see Fruit beetle, dried.
- Carriion insect inhabitants, 657.
- Carrot—
 bacterial blight in root beds and seed fields, 496.
- Carrot—Continued.
 leaf blight, spraying and dusting for, Fla. 347.
- Carrots—
 breeding, 328; Calif. 616.
 changes during growth and storage, [N.Y.]Cornell 49.
 culture and fertilizers, [N.Y.]Cornell 477.
 effect of environmental factors, [N.Y.]Cornell 770.
 Louisiana, production and marketing, La. 49.
- Casein—
 deaminized, anemia caused by, 892.
 deaminized, nutritional properties, Mo. 515.
 high-quality, manufacture, Idaho 95.
 manufacture by new methods, U.S.D.A. 95.
 manufacture for utilizing waste skim milk, 241.
 natural sour, manufacture, 242.
 optical rotation, 524.
- Caseinogen, tryptic digestion, 582.
- Cassava, variety tests, P.R. 174.
- Castor-bean tick, role of alternative hosts in maintenance, 821.
- Castor-beans—
 culture in Imperial Valley, Calif. 34.
 variety tests, S.C. 759.
- Cat flea—
 control, N.J. 74.
 reaction to infection with dog tapeworm, 664.
 transmission of hemorrhagic septicemia by, 386.
- Catalase of various parts of potato plant, 167.
- Catalpa, planting experiments, Ark. 784.
- Cataract in albino rats due to withdrawal of vitamin G from diet, 730.
- Catatorulin in brain, action, 874.
- Catolaccus hunteri*, notes, U.S.D.A. 653.
- Cats, disease due to filtrable virus, 843.
- Cattle—see also Calves, Cows, Heifers, Livestock, and Steers.
 Afrikaner, descent and origin, 32.
 baby beef, production, Iowa 854.
 beef—
 and dual-purpose, feeding, breeding, and management, U.S.D.A. 514.
 cost of production, Ky. 88.
 creep-feeding v. dry-lot feeding, W.Va. 671.
 feeding experiments, Wash. 89.
 grades, U.S.D.A. 87.
 growth and breeding qualities, effect of phosphorus and calcium, S.C. 823.
 improvement, U.S.D.A. 671.
 minerals for, Wyo. 671.
 pasture grasses for, tests, Fla. 371.
 phosphorus supplements for sugar beet byproduct rations, effect, Utah 371.

Cattle—Continued.

- beef—continued.
 - prices and index numbers, Mich. 124.
 - production in Georgia, Ga. 372.
 - record-of-performance studies, U.S.D.A. 671.
 - tests, Utah 371.
- blood, microfilaria in, 532.
- blood parasites, new, 387.
- breeder, purebred, program for, 243.
- breeding, S.C. 831.
- breeds, hematological studies, 839.
- cyanide poisoning, treatment, 253.
- dairy—*see also* Cows.
 - alfalfa hay and irrigated pasture without grain for, 523.
 - efficiency of feed utilization, 244.
 - experimental methods, 243.
 - feed consumption during growth, Mo. 95.
 - feeding experiments, Ark. 830; Nebr. 830; S.C. 831.
 - growth efficiency and nitrogen metabolism, Mo. 525.
 - increased hay feeding for, 523.
 - minerals for, 243; La. 97.
 - selection, suggestions for teaching, Ill. 559.
 - simplified rations for, W.Va. 680.
- different breeds and types, serological test for blood relationship, 98.
- diseases—*see also specific diseases*.
 - economic advisory council committee, report, 254.
- dual purpose and beef, studies in Everglades, Fla. 371.
- energy cost of horizontal walking, Mo. 85.
- farming in 1932–33, profitability. 266.
- fattening, machine-dried soybean hay for, La. 826.
- feeding byproducts of alcohol industry, P.R. 233.
- feeding experiments, [N.Y.]Cornell 830; Nebr. 822.
- finishing, problems in, 673.
- forage crops for, 376.
- grubs, control, Mo. 501.
- grubs in India, 229.
- Holstein-Friesian, inheritance of high butterfat percentage, 98.
- Holstein, inbreeding and outcrossing, N.J. 95.
- horned, blood picture, 692.
- in Dutch East Indies, nematode in skin of, 839.
- Jersey, milk production and butterfat percentage, 244.
- losses in North Dakota due to arrowgrass, 255.
- meat color, effect of feed, 674.
- new skin disease, 840.
- nutrition and feeding experiments, improvement, 523.

Cattle—Continued.

- nutrition experiments, improved stall for, 673.
 - of Northern Nigeria, feeding experiments, 515.
 - parasites of, 370; P.R. 531.
 - plague, *see* Rinderpest.
 - poisoning, *see* Livestock poisoning.
 - Plants, poisonous, and specific animals and plants.
 - policy, national, 708.
 - production, development and probable future, 708.
 - production on the range, costs and methods, Colo. 854.
 - range, fattening, Idaho 825.
 - rations, deficiencies in feeds used in, Fla. 376.
 - reproductive system, mycotic infections, 693.
 - shows, dairy, success in, 242.
 - sterility in, 387.
 - susceptibility to inoculations from tubercular skin lesions, Utah 382.
 - tick—*see also* Ticks.
 - repellent and killing effects of gondura grass on, 821.
 - twinning in, 463, 601.
 - vitamin A storage in, 86.
 - worms, estimating number in fourth stomach and small intestine, 103.
- Cauliflower—
- arsenical residue removal from, N.J. 52.
 - club root, control, 800.
 - culture and fertilizers, [N.Y.]Cornell 477.
 - destructive virus disease, 632.
 - New York market prices, N.J. 124.
 - production, N.Y.State 477.
 - storage, 52.
- Cedar apple rust, variations in pathogenicity, Iowa 787.
- Cedar rust resistance, W.Va. 635.
- Celeriac, New York market prices, N.J. 124.
- Celery—
- blackheart disease, U.S.D.A. 488.
 - breeding, Calif. 616; [N.Y.]Cornell 770.
 - chlorosis on alkaline soils, N.J. 47.
 - early blight epidemics in Florida, effect of weather, 496.
 - early blight, spraying and dusting for, Fla. 347.
 - frame-grown, control of blights, [N.Y.]Cornell 788.
 - leaf tier, studies, U.S.D.A. 633.
 - mosaic, southern, U.S.D.A. 633.
 - mosaic, southern, identification of virus, 496.
 - New York market prices, N.J. 124.
 - premature seeding, Mont. 184.
 - virus, cause of banana disease, 647.
 - virus on corn and other Gramineae, 639.
 - yellows in Wisconsin, Wis. 489.

Celery—Continued.

- yellow of Utah, relation to aster yellows, Calif. 647.
- yellows resistant, breeding, 631.

Cell—*see also* Plant cell.

- inclusion disease in fowls, 391, 697.
- sap concentration, determination in cambial zone, 750.
- wall structure of plants, 749.
- wall thickening in vascular plants, methods, 594.

Cellulose—

- decomposition by *Chaetomium* spp., U.S.D.A. 436.
- diffraction data, interpretations, 292.
- particles in membranes of cotton fibers, separation, 292.
- production from bagasse and cane straw, P.R. 150.

Cement, Portland, mortar, flexural strength, U.S.D.A. 702.

Cephalonomia gallicola, new parasite to tobacco beetle, 84.

Ceratia—

- orientalis* of cucurbits, 665.
- similis*, biology and control, 230.

Ceratitis capitata, *see* Fruit fly, Mediterranean.*Ceratomyiella*, key for separation of species and descriptions, 815.*Ceratostomella*—

- fimbriata*, notes, 799.
- ips*, notes, 211.
- ips*, production of perithecia in, 636.
- ulmi*, notes, 85, 819; U.S.D.A. 70, 488.
- ulmi*, physiological characteristics, 210.

Cercobodo sp., notes, 453.*Cercomonas longicauda*, notes, 453.

Cercopoidea of China, 659.

Cercospora—

- beticola*, notes, Iowa 787.
- capsici*, notes, Ga. 801.
- sp. on avocado, U.S.D.A. 633.
- spp. in pure culture, conidia production, 636.

Cercosporiella—

- foot rot, association with specific ecological area, 632.

herpotrichoides—

- cause of cereal foot rot, U.S.D.A. 791.
- control, U.S.D.A. 633.
- from foot rot damaged wheat in Germany, 793.
- notes, 644.

Cereal—

- crops, weeds in, control, 475.
- diseases, estimating loss in yield from, 630.
- foot rot, relation to mechanical injury, 631.
- grain crops for annual pasture, 319.
- grains for egg production and egg quality, Wyo. 374.
- market in Germany, regulation, 857.
- powdery mildew, studies, [N.Y.] Cornell 199.

Cereal—Continued.

- rusts—*see also* Rusts and specific hosts. in Tunisia, transmission and control, 62.

Cereals—*see also* Grain and specific grains. and rickets, 571.

- breakfast, hemoglobin-building properties, Wis. 559.
- breeding and other research, 606.
- for hay, varieties and field practices, Ohio 608.
- of Old and New Worlds, 467.
- seed bed preparations, Utah 316.
- yield in, 767.

Chabertia ovina, egg production by, 214.

Chalcid fly in alfalfa seed, Utah 359.

Chalcidoidea new species from West Indies, descriptions, 370.

Chalcids, parasitic, secretion of colleterial glands in, 73.

Chalcoedermus bonduri, new cotton pest in Argentina, 818.*Chamaecyparis lawsoniana*, canker on, 633.*Chaoborus lacustris*, effect of light, 359.

Chard, variety tests, Wis. 477.

Chayotes, tests, P.R. 174.

Cheese—

- American, making on farm, U.S.D.A. 836.

- American, quick freezing, Wis. 526.

- American, water and milk fat content, Me. 414.

- and butter cultures, 241.

- bacteriology and chemistry, U.S.D.A. 525.

- brick, controlling flavor, starter experiments, Wis. 526.

Cheddar—

- and foreign types, manufacture in Northwest, 242.

- from pasteurized milk, 243.

- manufacture, standardization of milk with skim milk powder for, 241.

- quality, effect of salt, 685.

- ripening, 835, 836.

- small packages for, U.S.D.A. 680.
- studies, 527.

cottage—

- composition, 242.

- effect of light, Mo. 525.

- from dehydrated milks, condition of manufacture and storage, Mo. 248.

- keeping qualities, relation to chlorine, Mo. 525.

- manufacture, use of dried whole milk in, Mo. 525.

- use of dehydrated milk in manufacture, 525.

- cream, manufacture, Nebr. 830.

- cream, manufacture, use of dry skim milk in, Mo. 101, 247, 525.

- factories, efficiency in operation, Wis. 526.

- factories, starters and starter making in, 686.

Cheese—Continued.

- factory operations in Quebec, 714.
 Gouda, bacterial color defect in, 686.
 increasing blue mold growth in, 525.
 manufacturing industry in Oklahoma, 375.
 Neufchatel and cream, 242.
 processed, sodium metaphosphate as emulsifying agent, Wis. 526.
 ripening, changes in casein during, 524.
 Roquefort, possibilities for state of Washington, 243.
 spreads, 525.
 Swiss, bacteriology, 686.
 Swiss, making, relation to bacteria control, U.S.D.A. 95.
 Swiss, methods for making, U.S.D.A. 525.
 Swiss, small packages for, U.S.D.A. 680.
 Cheesecloth enclosures, effect on flower crops, 343.
Chcilospirura hamulosa, notes, 109.
Chelonus texanus, notes, 813.
 Chemicals for extinguishing or retarding fires in forest areas, 194.
 Chemistry, colloid, *see* Colloid.
 Cherries—
 breeding, Iowa 769.
 cracking, 481; Idaho 46.
 culture in New York, N.Y.State 53.
 late-blooming, search for, Mo. 476.
 Montmorency, time for picking, W.Va. 617.
 Montmorency, training and pruning, W.Va. 617.
 physical properties and composition, relation to leaf area, 777.
 pollination, Calif. 616; Ohio 47.
 pruning, effect on growth of suckers, 338.
 root distribution, Ark. 768.
 selection of understocks for, W.Va. 617.
 Shadow Amarelle, unfruitful sport of, 338.
 sour, spraying experiments, Tenn. 802.
 understocks, mazzard v. mahaleb, N.Y. State 617.
 varieties, new, in Russia, 773.
 variety tests, Utah 327.
 winter injury of 1933-34, N.Y.State 333.
 winter injury to, Pa. 769.
 zinc sulfate treatment for, 499.

Cherry—

- aphid, black, notes, Mont. 807.
 buckskin disease, susceptibility to, effect of rootstocks, 646.
 canker on nursery stock, control, Iowa 787.
 casebearer, control in Wisconsin, 509.
 casebearer on apples, control, Wis. 502.
 casebearer parasite, biology, 668.
 casebearer parasites, Wis. 502.
 crinkle leaf, control, Calif. 616.
 curl leaf, related to root injury, Wis. 489.

Cherry—Continued.

- disease on English Morello variety, 646.
 fruit fly, black, notes, Mont. 807.
 fruit fly, notes, N.Y.State 654.
 leaf miners, identification, 365.
 leaf spot, control, Nebr. 788; Wis. 489.
 leaf spot control, bordeaux mixture v. lime-sulfur for, Iowa 787.
 maggot, spraying programs for, 218.
 seeds after-ripening, effect of low temperatures, 478.
 seeds, development, physiology, N.Y. State 617.
 seeds, mazzard and mahaleb, after-ripening, Utah 327.
 understock trials, Utah 327.
 Chiasma frequency in *Avena* species, 598.
 Chick embryo—
 inoculated with equine encephalomyelitis virus, intranuclear inclusions in brain, 842.
 malposition head-under-left-wing in, causes, 680.
 Chicken—
 head louse, life cycle and bionomics, 506.
 livers, vitamin A storage in, 87.
 louse, control, 820.
 Chickens—*see also* Chicks, Fowls, Hens, Poultry, and Pullets.
 prices and index numbers, Mich. 124.
 Chickpeas, culture in Imperial Valley, Calif. 34.
 Chicks—
 brooding, Pa. 823.
 brooding, feeding, and management, Ohio 828.
 day-old, feasibility of sex segregation, 240.
 effect of proteins in poultry ration, 371.
 electric brooding, [N.Y.]Cornell 846.
 fish meals for, comparison, 671.
 growth and sexual maturity, relation to juvenile plumage, 240.
 growth, sex difference in, variation, 520.
 hatching throughout the year, Hawaii 371.
 hemorrhages in, a new deficiency disease, 520.
 mineral requirements, 371.
 nutrition studies, 236.
 on vitamin A-deficient rations, development of lesions in, Idaho 88.
 protein supplements, nutritive value, N.Mex. 93.
 scurvy-like disease in, 520.
 sex differentiation, morphological study, 173.
 sexing at hatching time, U.S.D.A. 94.
 sexing principles and practices, 240.
 sex-linked pullet, cost of rearing, 266.
 slipped tendon in, cause, Iowa 92.

Chicks—Continued.

- slipped tendon in, effect of unbalanced mineral ratio, Wis. 515.
- slipped tendons, preventives, Iowa 822.
- utilization of calcium from calcium carbonate and calcium gluconate, 678.

vitamin supplements for, Mo. 514.

Children—see also Girls and Infants.

- anemic, response to iron and copper treatment, Wis. 560.
- preschool, health needs, contribution of nursery school to, 134.
- rural, elementary education for, relative costs, Iowa 863.
- rural school, height, weight, age data, Utah 413.
- rural school, supplementary feeding, Mass. 134.
- school, of Texas, dental decay among, Tex. 136.
- school, standing heights, 134.

Chili—see also Peppers.

- wilt, etiology and control, N.Mex. 207.

Chinch bug—

- bionomics and control, Iowa 806.
- control, Mo. 501.
- control, paper barriers for, 78.
- food plants, 358.
- in Ohio, Ohio 218.
- notes, U.S.D.A. 653.

Chionaspis salicis, population density and egg production, 217.

Chlorate poisoning in cattle, 105.

Chlorophyll deficiency—

- in beans, hereditary, 462.
- in New World cottons, inheritance, 310.

Chloropicrin, fumigation for control of soil fungi, 633.

Chlorosis—

- in orange trees, relation to mineral constituents, 748.
- in peaches and roses, control, 637.
- in Utah, nature and control, Utah 347.

Choanotaenia infundibuliformis, notes, 257.

Chocolate milk, nonsettling preparation, milk-soluble, 836.

Chocolate moth, notes, 365.

Cholesterol—

- floridin activation of, Iowa 822.
- free and bound, in brain of normal and polyneuritic animals, 417.
- in livers of human beings, 881.
- irradiated, antirachitic efficacy, 888.
- provitamin D of, 888.

Choneiulus palmatus on mushrooms, 506.*Chorthophila cilicrura*, see Seed-corn maggot.*Chorthophila rubicola* n.sp. on raspberry shoots, 217.

Chromosome lengths in peas, cell size in relation to, 753.

Chromosomes—

- behavior in *Pinus banksiana* following fertilization, 462.

Chromosomes—Continued.

fragmentation in *Lilium tigrinum*, 170.

in Musaceae, genetical and cytological studies, 755.

number in *Iris*, 601.

number in pears, 753.

number in *Saccharum* and hybrid, 169.

structure under infrared rays, 751.

Chrysanthemum lace bug, studies, Mich. 224.*Chrysanthemums*—

breeding improved varieties, Iowa, 768.

nutritional studies, 343.

water needs, Ohio 486.

Chrysobothris—

canadensis n.sp., description, 230.

oregona n.sp., description, 230.

species of Horn's group IV, key, 230.

Chrysomphalus—

aurantii, see Red scale, California.

ficus, control, 656.

Chrysomya rufifacies larvae, nutrition, 367.

Churn contamination and keeping quality of butter, 241.

Cicadas, relation to agriculture, 362.

Cicadula divisa, see Leaf hopper, six-spotted.

Cider—

making for roadside stands, N.Y.State 297.

making on farm, N.Y.State 158.

studies, N.Y.State 581.

vinegar, making on farm, N.Y.State 158.

Cimex lectularius, see Bedbugs.*Cistogaster immaculata*, notes, 224.

Citrus—see also Lemons, Oranges, etc.

anthracnose, symptoms, 789.

aphid, green, notes, Fla. 358.

aphids, diseases of, Fla. 358.

borax treatment to prevent decay, U.S.D.A. 616.

bronzing, relation to soil fertility and fertilizers, 780.

brown rot, control, Calif. 634.

canker, eradication, U.S.D.A. 634.

cover crops, Fla. 327.

culture in Hawaii, Hawaii 191.

damping-off, biological control, Calif. 634.

die-back, notes, Fla. 347.

diseases in Minas Geraes, Brazil, 355.

effect of zinc sulfate, 781.

Experiment Station, achievements, Calif. 626.

fertilizer experiments, Fla. 298.

fruit ash, less common mineral constituents in, Fla. 413.

fruit, cost of handling from tree to car, Fla. 120.

fruits—

ability to withstand pressure, device for measuring, 781.

adaptability tests, S.C. 769.

Citrus—Continued.

fruits—continued.

Lorax treatment for stem-end rot, U.S.D.A. 69.

Chinese, studies, 564.

decays in storage, Fla. 347.

dropping and oviposition punctures of Mediterranean fruit fly, correlation, 366.

effect of fertilizers and soil amendments, 780.

glucosides and minerals in, 781.

pectic constituents, Fla. 5.

growth and reproduction, relation to nitrogen absorption and storage, Fla. 327.

hybrids, Fla. 327.

insects, control, handbooks, 657.

juices and pulps, preservation, Fla. 327.

leaf miner, studies, 662.

leaf mite, notes, 655.

leaf roller, studies, 662.

melanose and scab, life history and control, 499.

melanose and stem-end rot, notes, Fla. 347.

melanose, symptoms, 789.

mottle-leaf, control by zinc sulfate-lime sprays, Calif. 634.

mulching, Fla. 327.

pests in Formosa, 820.

production, development and probable future, 708.

propagation and hybridization, Fla. 327.

psorosis, Calif. 634; Fla. 346.

red mite, notes, 514.

research, Calif. 616.

root disease, new, unmasking, 355.

scab, control, Fla. 347.

scale control problems of citrus producing areas of world, 812.

scale insects, composition, relation to resistance to hydrocyanic acid fumigation, 507.

scale insects in Queensland, control, 225.

scales, effect on sulfuring against, 219.

scion influence on rootstock, 341.

scions, yearling, size, relation to size and age of budwood, 483.

soils, U.S.D.A. 448.

stem-end rot, notes, Fla. 347.

stocks, tests for disease resistance, Calif. 634.

thrips, effect of sulfuring against, 219.

thrips, notes, U.S.D.A. 653.

trees, vaccination experiments against fungus attack, Calif. 634.

wastage in Transvaal, 782.

whitefly, see Whiteflies.

Cittotaenia ctenoides, notes, 699.*Cladosporium*—*fulvum*, notes, 801.*fulvum* on tomato, breeding for resistance, Ohio 208.*ptiscolum* n.sp., proposed name, 498.

Clay subsoil, improvement, Mo. 448.

Claypans—

in soils, development, Mo. 17.

relation to colloids, U.S.D.A. 448.

Clemson College, notes, 431.

Climate—see also Meteorology.

and physical needs of plants, 159.

and soil microbiology, 588.

effect of proposed shelter belt in center of country, 12.

of lower air strata, relation to plant and animal life, 588.

Climatological data, U.S.D.A. 13, 159, 160, 741, 742.

Climatology, handbook, 446.

Clitocybe tabescens of citrus trees and other woody plants, 355; Fla. 346.

Closets and storage arrangements for farm home, 734.

Clostridium—

spp., nitrogen-fixing, metabolism, Iowa 19.

welchii, notes, 106.

Clothes moths—

fish meal as food, 74.

hydrogenated naphthalene for, 73.

studies, [N.Y.] Cornell 807.

Clothing—

and textiles, tests, U.S.D.A. 572.

fumigable storage for, U.S.D.A. 653.

purchased by farm families, [N.Y.] Cornell 733.

Clover—

alsike, breeding, N.J. 35.

alsike, effect of cutting at different times, Iowa 757.

bur, cultivation and utilization, U.S. D.A. 762.

certified seed production, rules and requirements for, N.J. 616.

clipping, effects, 609.

culture experiments, Fla. 316.

culture in Imperial Valley, Calif. 34.

head weevil in western Washington, 358.

in turf, action of ammonium salts on, 607.

leaflets, excised, dry weight and respiration, effect of mildew and rust, 493.

red, adaptation, relation to root reserves, Ky. 35.

red, adapted for New Jersey, N.J. 319.

red, alfalfa, and sweetclover as soil-building crops, comparison, Iowa 743.

red, breeding, N.J. 35; U.S.D.A. 605.

red, compatibility, genetics of, 168.

red, diseases in Arizona, key, Ariz. 346.

red, diseases, studies, Ky. 60.

red, effect of cutting at different times, Iowa 757.

red, for seed, culture experiments, Idaho 35.

red, for seed, fertilizer experiments, Idaho 35.

red, infusions, forms of nitrogen in, 150.

Clover—Continued.

- red, parasites on excised leaves, behavior, 351.
- red, pollination by bees in Colorado, 666.
- red, root habits in humid soils of New Jersey, 36.
- red, seed production, 317.
- red, variety tests, Iowa 757; Ky. 35; N.J. 35.
- response to treatment on acidic upland soils, 607.
- root curculio, control, Ky. 74.
- root curculio, damage to alfalfa, 82; Ky. 512.
- seed production, effect of bees, 666.
- seeds, hardness in, effect of storage conditions, 175.
- seeds, weight for 1,000, Md. 45.
- springtail in Western Australia, 656.
- sweet, *see* Sweetclover.
- varieties, shelled and unshelled seeds, effect on root nodule formation, 761.
- Cnephasia longana*, life habits, 654.
- Coal tar-kerosene emulsion as protection of seeds and plant cuttings against ants, 808.
- Coals, low grade and waste, utilization, 852.
- Cobalt in animal tissues, distribution, Wis. 560.
- Coccidia—
 - in English sparrow, 688.
 - infection with single oocyst, significance, 530.
 - intestinal, from rabbits, cross-infection experiments on chicks, 537.
 - oocysts, effect of incubation heat, Wis. 529.
 - species in animals and man, 103.
- Coccidiosis—
 - cecal, prolonged case, 214.
 - chronic, 688; Calif. 689.
 - control, Ark. 845.
 - effect of starvation and removal of ceca, 536.
 - immunity, nature of, 688.
 - immunity or resistance to infection, 536.
 - in animals and man, 103.
 - in fowls, status, 536.
 - in lambs, Colo. 837.
- Coccomyces*—
 - hiemalis*, notes, Nebr. 788.
 - leaf spot of cherries, spraying for, Tenn. 802.
- Cochlidion limacodes*, notes, 217.
- Cochliobolus*—
 - heterostrophus* n.g. and n.comb., description, 636.
 - phytopathological and taxonomic aspects, 635.
- Cochliomyia*—
 - and myiasis in tropical America, 815.
 - spp., destructive outbreak, 688.
- Cochlosoma rostratum* n.sp. in ducks, 261.
- Cockerels, Leghorn, disposition, Ohio, 829.

- Cocklebur seed, germination, effect of reduced oxygen, 593.
- Cockroach—
 - American, tests of insecticides for, 504.
 - temperature and humidity relations, 362.
- Cockroaches—
 - as test animals in nutrition studies, [N.Y.]Cornell 822.
 - control, 658.
 - paralytic action of nicotine, effect of different salts, 503.
- Cocoa, stored, infestation by coffee bean weevil and fig moth, 666.
- Coconut—
 - bud rot, etiology, 789.
 - caterpillar, bionomics, natural enemies, and control, 662.
 - caterpillar, control, 808.
 - insects in Tanganyika, 655.
 - leaf beetle, biological control in Celebes, 817.
 - pests, control, 808.
 - scale, control, 656.
- Coconuts, fertilizer experiments, P.R. 182.
- Codling moth—
 - bait pails and bands for, W.Va. 654.
 - control, 654, 661; Idaho 74; Ind. 47; Pa. 807; U.S.D.A. 653.
 - control, arsenical spray substitutes for, Mo. 501.
 - control in Colorado, 358.
 - control in Northwest, 814.
 - control, nicotine in, 358, 364, 508; U.S.D.A. 502.
 - control, treated bands for, U.S.D.A. 74.
 - control, trends in, 358.
 - control with corrugated paper bands, new dipping apparatus for, 80.
 - distribution, morphology, biology, and control, 662.
 - experiments, Iowa 806.
 - in apples, effect of intensity of light, 359.
 - life history and control, Calif. 654.
 - life history and habits in New Zealand, 364.
 - notes, Mo. 501; Mont. 807; N.Y.State 654.
 - pigment granules in eye affecting behavior, 813.
 - record of bait trapping, Idaho 74.
 - spray programs for, 218, 227.
 - sprays, proper timing by use of bait traps, Wis. 502.
 - studies, N.J. 74.
 - studies in Indiana, 216.
 - toxicological studies, improved technique, 508.
- Cod-liver oil—
 - alleged toxicity, 424, 565.
 - as protection against the common cold, 137.
 - consumption, effect on human milk, 728.
 - effect on egg quality and hatchability, Mo. 514.

Cod-liver oil—Continued.

- irradiated ergosterol, and butter, anti-rachitic factor, differentiation, 685.
- mixed fatty acids from, absorption spectra, 152.
- v. irradiated ergosterol for chicks, 237.
- v. sardine oil as source of vitamin A, Idaho 88.

Cod-liver stearin for growing chicks, anti-rachitic value, Nebr. 822.

Coffee—

- bean weevil, infestation of stored cocoa by, 666.
- beans, composition of glycerides of oil in, 441.
- black rot in Mysore, 355.
- caffeine, and decaffeinated coffee, effect on blood pressure and pulse rate, 873.
- color from cream treated in various ways, 524.
- culture, Hawaii 327.
- economic and technical aspects, 708.
- insects in Tanganyika, 655.
- leaf miner, notes, P.R. 216.
- plant, cytology, 483.
- plantations, establishment and maintenance, 192.
- pulp as compost for coffee fields, Hawaii 327.
- research, coordination in East Africa, 789.
- stem borer in Mysore, 368.
- tree in Brazil, histological study, 598.
- variety and fertilizer tests, P.R. 182.

Coke oven wastes, utilization, 852.

Colds, relation to vitamin A, 281; W.Va. 728.

Colds, vitamin therapy in, 137.

Coleophora pruniella, see Cherry casebearer.

Coleoptera—

- of India, immature stages, 511.
- of New Zealand, 666.
- of Utah, distribution, 510.

Coleus, nutritional conditions, relation to vitamin A, Iowa 769.

Coli in milk, 525.

Coli-aerogenes bacteria in milk, desirability of test, 242.

Coliform organisms and keeping quality of milk, 100.

Collards, truck crop for Louisiana, La. 771.

Collective bargaining, case for an independent body, 855.

Colleges, see Agricultural college.

Collembola of Iowa, monograph, 360.

Colletotrichum—

- atramentarium*, notes, 798.
- fragariae*, notes, 630.
- gossypii*, notes, S.C. 789.
- lagenarium*, notes, Iowa 787.
- pisi*, notes, U.S.D.A. 640.
- sp. on tomato, 352.
- trifolii*, notes, 351.

Colloid soil chemistry, N.J. 14.

Colloidal behavior of soils, laws, 162, 450, 745.

Colloids, soil—

- sorption of liquids by, 450.
- water content, relation to chemical composition, Mo. 448.
- water intake and swelling, Mo. 448.

Color in the garden, treatise, 192.

Colorado Station, report, 894.

Coloring matters, natural, relation to vitamins, 279.

Colpoda steinii, notes, 453.

Colts, draft—

- growth, Mo. 515.

liberal v. limited rations for, Mich. 827.

Columbine borer, studies, [N.Y.] Cornell 867.

Combines in Saskatchewan and Alberta, cost studies, 862.

Commodities bought by farmers, prices, index numbers, U.S.D.A. 860.

Compodea fragilis, notes, 73.

Compositae, anomalous secondary thickening in, 458.

Concrete—

- asphalt, for floor construction, Mich. 263.

curing, Columbia manual, 702.

curing, cotton mats for, tests, U.S.D.A. 395.

joists, precast, in floor construction, 542, 543.

masonry walls, fire resistance and strength, tests, 397.

pavement construction of Portland cement, U.S.D.A. 112.

produced in large mixers, effect of mixing time, U.S.D.A. 395.

strength, mortar tests, 396.

use on farms, 112.

Condensation of moisture in flues, 265.

Conifers—

- classification, 159.

damping-off control, factors in, 630.

growth, leader, needle, cambial, and root, interrelations, 344.

Coniothyrium—

- of rose, symptoms, 789.

sp. spores, resistance to low temperatures, 29.

Connecticut [New Haven] Station, report, 429.

Conotrachelus nenuphar, see Plum curculio.*Contarinia gossypii*, notes, 75.*Contarinia tritici*, see Wheat midge.

Cooking—

- electrical, factors of economy in, Me. 139.

practices in Maine households, survey, Me. 425.

utensils of different materials, application of heat to, Iowa 894.

utensils, thermal efficiency, factors in, 574.

Cooperation—see also Agricultural cooperation and Marketing.

American, papers and discussions, 411.

Cooperative organization, major types, Colo. 854.

Copper—

- containing fungicides, effect on transpiration rate, 790.
- effect on milk, 834.
- in California prunes, 868.
- in milk throughout the season, 523.
- insecticides, effect on natural control of whiteflies on oranges, 220.
- oil-soluble, as fungicide, 633.
- oxide, red, as spray and dust fungicide, N.Y.State 635.
- phosphate and bentonite-lime as fungicide, U.S.D.A. 633.
- protective action against *Trypanosoma equiperdum* infection, 389.
- role in carbohydrate metabolism, 877.
- spray, colloidal, home-made, 631.
- sprays, effect on oats growth, N.H. 476.
- sprays for grape downy mildew control, 802.
- sulfate toxicity for *Sclerotinia americana*, 631.

Corn—

- agricultural and industrial use, Iowa 854.
- and hogs, elasticity of supply for different farming areas, Iowa 854.
- and legumes, interplanting, Ark. 756; S.C. 759.
- and sorghum, comparison, Nebr. 758.
- and soybeans, production, La. 115.
- anthocyanin pigment production in, linkage relations, 168.
- bacterial leaf blight, 630.
- bacterial stalk rot in Indiana, U.S.D.A. 195.
- bacterial wilt, 630.
- bacterial wilt, breeding for resistance to, U.S.D.A. 633.
- bacterial wilt in 1934, U.S.D.A. 59.
- binder with elevator for harvesting silage corn, Md. 110.
- borer, European—
 - ✓ control, use of farm machinery for, U.S.D.A. 705.
 - ✓ fungus attacking, 508.
 - ✓ in Vermont, control, 662.
 - ✓ notes, N.Y.State 634.
 - ✓ parasite, biology, U.S.D.A. 819.
 - ✓ quarantine work with, U.S.D.A. 653.
 - ✓ tissues, *Beauveria bassiana* in, penetration and development, 814.
- breeding, Ark. 756; Calif. 606; Fla. 316; Ga.Coastal Plain 757; Ky. 35; Mo. 466; N.J. 35; Nebr. 758; U.S.D.A. 605.
- cash, movements in price, Iowa 854.
- certified seed production, rules and requirements for, N.J. 616.
- critical period in northeastern Kansas, U.S.D.A. 740.
- crop, utilization for fattening steers, Mich. 236.

Corn—Continued.

- culture experiments, Ark. 756; Fla. 316; Idaho 35; Nebr. 758; S.C. 759; Wyo. 606.
- culture in Imperial Valley, Calif. 34.
- cutter, low-cutting sled, description, U.S.D.A. 851.
- cytogenetic studies, [N.Y.]Cornell 758.
- diseases in Arizona, key, Ariz. 346.
- ear rot diseases, Fla. 346.
- ear rot, new, in Florida, 794.
- ear rots, incidence, U.S.D.A. 488.
- ear worm, control, Ky. 74.
- ear worm, low-cost method of fighting, 228.
- ear worm, notes, Fla. 358; N.J. 74; N.Y.State 654.
- effect of artificial injury, Iowa 757.
- effect of legumes in rotation, Ky. 35.
- feeding value, Idaho 825.
- fertilizer experiments, Fla. 316; Ga.Coastal Plain 757.
- flea beetle, notes, U.S.D.A. 653.
- fodder, ground, with molasses and cottonseed meal, feeding value, S.C. 831.
- for grain and silage, variety tests, U.S.D.A. 759.
- for silage, breeding, [N.Y.]Cornell 758.
- genetics of, review, 752.
- heat-resistant and heat-susceptible, bound water in leaf tissues, 630.
- historical and botanical status, N.Y.State 329.
- hog situation under the Agricultural Adjustment Administration, 267.
- hybrid inbred, superior quality, N.Y.State 617.
- hybrid strains, production, Wis. 467.
- inbred lines and crosses, response to variations of nitrogen and phosphorus, 469.
- infection by *Diplodia zeae*, relation to soil moisture, Iowa 788.
- insects and diseases, control, Ala. 358.
- iodine in, Ky. 8.
- Iowa's commercial, destination, Iowa 119.
- irradiation, genetic and cytological effects, Mo. 466.
- irrigation, Ark. 756.
- kernel, factors affecting rachitogenic properties, 571.
- kernels, damage by fungi, U.S.D.A. 638.
- leaf aphid, summer activities, 78.
- oil, rancidity, U.S.D.A. 436.
- origin and natural relationships, 762.
- pasturing with hogs, U.S.D.A. 827.
- pasturing with sheep, U.S.D.A. 826.
- pathogenicity of *Basisporium gallarum* to, Iowa 788.
- planter fertilizer attachments, tests, Mo. 539.
- planting and husking, Mo. 547.
- planting, surface, furrow, and listed methods, 175.

Corn—Continued.

- planting tests, Colo. 757.
- plants, composition, effect of failure of pollination, 38.
- prices and index numbers, Mich. 124.
- production, development and probable future, 708.
- production, improved machinery for, U.S.D.A. 699.
- production, labor requirements for 100 bushels, Ark. 861.
- production methods, Iowa 846.
- reciprocal top crosses in, comparison, 175.
- research, Iowa 758.
- R-g₁ chromosome, linkage data, 309.
- root habits in humid soils of New Jersey, 36.
- rotation experiments, U.S.D.A. 759.
- rust, heterothallism in, 633.
- seed treatment, effect on stand and yield in Kansas, 609.
- seed treatment, physiological response of growing plant to, Iowa 788.
- seedling blight resistance, nature, 630.
- silage, *see* Silage.
- smut—*see also* Smuts.
 - mode of entrance, 639.
 - nodal infection, factors affecting, Iowa 788.
- Stewart's disease, vector, U.S.D.A. 653.
- stover infusions, forms of nitrogen in, 150.
- supplements for fattening hogs on alfalfa pasture, 677.
- sweet, *see* Sweet corn.
- types for growing and fattening pigs, Iowa 822.
- varieties for different regions in Maryland, Md. 36.
- varieties, tillering in, Ark. 756.
- variety tests, Ark. 756; Fla. 316; Ga.Coastal Plain 757; Mo. 466; N.J. 35; Nebr. 758; P.R. 174; S.C. 759; Utah 316; Wyo. 606.
- variety tests, effect of adjacent plats, 319.
- vernalization experiments, 38, 607.
- winter cover crops for, Ga.Coastal Plain 757.
- X-rayed, chromosomal interchanges, 168.
- yellow, composition, relation to rachitogenic properties, 138.
- yellow, effect on egg quality and hatchability, Mo. 514.
- yellow, scabbed and normal barley, comparison for pullets, U.S.D.A. 237.
- yellow, value for southern farmers, 370.
- yield and color, relation, Wis. 467.
- yield following Sudan grass and soybeans, 609.

Cornstalk—

- beetle, rough-headed, studies, Ark. 806.
- borer, southern, studies, S.C. 807.

- Cornstalks, use as heating medium for plant beds, Ky. 47.
- Corrosion, practical problems, 848.
- Corticium koleroga*, notes, 355.
- Corynebacterium ovis*, notes, 840.
- Coryneum—**
 - beijerinckii* infection of almond blossoms, 633.
 - delleantii* n.sp., description, 210.
 - of apricots, control, 645.
- Corythucha marmorata*, studies, Mich. 224.
- Coryza—**
 - infectious, in Greece, 258.
 - or cold in chickens, types, Calif. 689.
- Cosmopolites sordidus*, *see* Banana root borer.
- Cost of living on farms, Ill. 285; Mo. 547.
- Cost of production, *see specific crops*.
- Cotoneaster seeds, after-ripening and germination, 342.
- Cotton—**
 - Acala, effects of irrigation schemes, N.Mex. 39.
 - American wild, with thirteen chromosomes, 31.
 - and cottonseed, Department publications on and list of depository libraries, U.S.D.A. 763.
 - and related species, cytogenetic notes, 461.
 - angular leaf spot and black arm in the Sudan, 351.
 - Asiatic, inheritance of leaf shape, 310.
 - baled, fumigation, U.S.D.A. 653.
 - black arm in Uganda, 351.
 - blister mite, notes, 75.
 - boll borer, important pest of cotton in Peru, 814.
 - bollweevil, *see* Bollweevil.
 - bollworm, *see* Bollworm.
 - borer, wild, notes, 75.
 - breeding, Ark. 756; Fla. 316; U.S.D.A. 605.
 - breeding for fiber length regularity, 763.
 - breeding, review of literature, 763.
 - chromosome numbers and melotic behavior, 31.
 - community production, U.S.D.A. 605.
 - culture experiments, Ark. 756; Fla. 316; Ga.Coastal Plain 757; S.C. 759.
 - culture in Imperial Valley, Calif. 34.
 - damping-off, notes, S.C. 789.
 - diseases in Arizona, key, Ariz. 346.
 - dusting, machinery for, U.S.D.A. 117.
 - earliness, relation to bollweevil injury, Ark. 806.
 - Egyptian type, noncompetitive crop for western irrigated lands, U.S.D.A. 34.
 - fabrics, durability, Mo. 573.
 - fabrics, white, analysis, Ohio 893.
 - fertilizer experiments, Ark. 756, 757; Fla. 316; Ga.Coastal Plain 757; S.C. 759; U.S.D.A. 448.
 - fertilizer placement tests, cooperative, 315.

Cotton—Continued.

- fiber, effect of soil type and season, Ark. 757.
- fiber length and distribution, S.C. 759.
- fiber length, distribution, photo-electric method for determining, Ark. 757.
- fiber properties, symposium, 320.
- fiber sorter, Pressley, operation and application, Ariz. 763.
- fibers, action of pectic solvents, 593.
- fibers, dye absorption, 572.
- fibers, length, effect of fertilizers and rainfall, 315.
- fibers, seasonal variations in, 176.
- fibers, separation of cellulose particles in, 292.
- field experiments, size, shape, and replication of plats, 175.
- flea hopper, studies, S.C. 807; U.S.D.A. 653.
- genetic studies, 309, 320; Ark. 756.
- ginned in South Carolina, percentage distribution of staple length, S.C. 855.
- ginning, U.S.D.A. 699.
- grade and staple reports, determining size of sample, 854.
- hairs from epidermis of seed, differentiation, 177.
- in the seed in Oklahoma, sale, Okla. 553.
- insects and diseases, Ala. 358.
- insects, studies, S.C. 807; U.S.D.A. 653.
- irrigation, Ark. 756; Tex. 176.
- Ishan, under mixed cultivation, 176.
- leaf miner, notes, 75.
- lint length, factors affecting, 315.
- machine-snapped v. hand-picked, 315.
- motes in, 177.
- nitrogen fertilizers for, U.S.D.A. 455.
- nitrogen sources, effect on fruiting and organic constituents, Ga. 38.
- of India, standard, technological reports, 139.
- one-variety communities in New Mexico, U.S.D.A. 119.
- pests and diseases, papers on, 320.
- pests in Tanganyika, 655.
- plants, snaky, 601.
- price at farm, relation to quality, Tenn. 407.
- prices, relation to grade and staple length, N.C. 124.
- production, cover crops v. fresh manure, S.C. 759.
- production, development and probable future, 708.
- production, improved machinery for, U.S.D.A. 699.
- production in Anglo-Egyptian Sudan, U.S.D.A. 408.
- production in Egypt, U.S.D.A. 552.
- production, labor requirements for one bale, Ark. 861.
- production, profitableness, relation to fertilization and selling price, 315.
- pruner, new pest in Argentina, 818.

Cotton—Continued.

- quality from New Mexico, N.Mex. 408.
- regional test, 764.
- regions in U. S. S. R., climate, 12.
- research in Puerto Rico, P.R. 174.
- root rot and crazy top, control, U.S.D.A. 633.
- root rot, control, relation to fertilizers, U.S.D.A. 494.
- root rot, effect of crop rotation and tillage, U.S.D.A. 794.
- root rot fungus, morphology and life history, 493, 631.
- root rot fungus, persistent strands, 493.
- root rot in Texas, 345.
- root rot, insect vectors, 345.
- root rot, losses from, 794.
- root rot sclerotia, longevity, effect of soil moisture, 794.
- root rot, soil treatments for, 633.
- samples, staple-length observations on, 854.
- seed, *see* Cottonseed.
- seedling diseases, S.C. 789.
- seedlings, sore shin and other types of damping-off, etiology and control, Ark. 786.
- self-pollinating, new method, U.S.D.A. 39.
- sheets, wearing qualities, tests, U.S.D.A. 572.
- situation, Okla. 401, 707.
- sore shin, nematode associated with, U.S.D.A. 633.
- stainers and internal boll disease, 362.
- staple length designations of press-box and cut samples, measuring differences, U.S.D.A. 321.
- textiles, effect of atmospheric sulfur dioxide, 573.
- thrips, biology and control, S.C. 807.
- Tingitoidae affecting, 224.
- transport and storage of nitrogen in, 459.
- under Agricultural Adjustment Act, 407.
- under irrigation in the Sudan, growth analysis, 610.
- varieties, early, relation to bollweevil injury, 83.
- varieties, length and uniformity of staple, La. 763.
- variety tests, Ark. 756; Fla. 316; Ga. Coastal Plain 757; Mo. 466; S.C. 759.
- vernalization, 321.
- Verticillium* wilt in Greece, 346.
- volume reduction and quality improvement, U.S.D.A. 34.
- weather-proofing, U.S.D.A. 436.
- wild, in Florida, insects and a mite of economic importance on, 75.
- wilt, insect vectors, 346.
- wilt resistance, Ark. 786; U.S.D.A. 633.
- winter cover crops for, Ga.Coastal Plain 757.

Cotton—Continued.

- winter legume cover crops with and without sodium nitrate, S.C. 759.
- workers of British Empire, conference. proceedings, 320.
- worm in Egypt, 661.
- yield, effect of preceding corn and legume mixture, Ark. 756.

Cottonseed—

- action of electric current on, 321.
- allergy, 570.
- and cotton, Department publications on and list of depository libraries, U.S.D.A. 763.
- flour, vitamins B and G in, 138.
- meal and hulls, feeding methods to fattening steers, S.C. 823.
- meal and udder troubles, U.S.D.A. 525.
- meal as principal source of protein for dairy cattle, N.Mex. 832.
- meal, effect on dairy heifers, Pa. 831.
- meal, feeding value, 376, 675.
- meal in rations of horses and mules, Tex. 236.
- meal, nutritive value for chicks, N.Mex. 93.
- oil, rancidity, U.S.D.A. 436.
- purity in, value of single lock samples as measure, 321.
- sterilizer, U.S.D.A. 653.
- treatments, S.C. 759.

Cottonwood chlorosis, notes, Wyo. 635.

Cottony-cushion scale, notes, P.R. 216.

Country, *see* Rural.

County—

- consolidation in Colorado, 854.
- expenditures for all purposes, Mo. 547.
- expenditures of California, Calif. 272.
- government in Colorado, Colo. 558.

Cover crops—

- for citrus, Fla. 327.
- legume, for orchards, N.Y. State 617.
- management, effect on soil fertility, 48.
- variety tests, Fla. 316.

Cowpeas—

- blackeye, breeding for disease resistance, 632.
- breeding, Calif. 606.
- composition, effect of potassium, 165.
- culture in Imperial Valley, Calif. 34.
- for growing and fattening swine, Ark. 821.
- for seed and hay, variety tests, Ark. 756.
- variety tests, Ga. Coastal Plain 757.
- variety-time-of-planting tests, Fla. 316.

Cows—*see also* Calves, Cattle, and Heifers.

- acid-base balance during and after pregnancy, 692.
- chopped hay for, Vt. 95.
- conformation and anatomy, relation to fat production, U.S.D.A. 525.
- conformation, internal anatomy and producing capacity, U.S.D.A. 680.
- conformation, relation to milk production, 681, 682.
- dairy, calcium in rations, 375.

Cows—Continued.

- dairy, value of succulent feeds for, Vt. 95.
 - energy metabolism, effect of environmental temperature, 524.
 - feeding experiments, significance of body weights in, 523.
 - feeding with and without grain, Mont. 681.
 - freshening ages in Iowa cow testing associations, 681.
 - grain v. no grain for, Wyo. 96.
 - heavy milking, protein requirements, Hawaii 376.
 - increased hay feeding, returns from, Ohio 96.
 - Jersey, butterfat production, S.C. 831.
 - milk production, *see* Milk production.
 - nutrition and vitamin A requirements, U.S.D.A. 525.
 - of testing association herds, milk and fat production, persistency and inheritance, Iowa 755.
 - purebred beef, reducing cost of wintering, S.C. 823.
 - Sindhi, period required for conception after calving, 681.
 - soybean silage for, Fla. 376.
 - sterility in, relation to vitamin E, Iowa 830.
 - time of ovulation in, U.S.D.A. 463.
 - transplanting gonadal tissue in, results, 33.
 - udders, *see* Udder.
 - utilization of nutrients, effect of nutritional plane, Vt. 95.
 - vitamin A requirements, Tex. 244.
 - water requirements, Idaho 95.
- Coyotes, winter food habits, 651.
- Crambus emmerzellus*, notes, 656.
- Cranberries—
- cross pollination, 778.
 - fertilizer experiments, 778; N.J. 47.
 - keeping quality, relation to composition, 191.
- Cranberry—
- cuttings, depth of planting, N.J. 47.
 - false blossom disease, vector of, N.J. 75.
 - false blossom, spread, 632.
 - fireworms, control, N.J. 74.
 - weevil on blueberries, N.J. 75.
- Crassiphiala ambloplitis*, life history, 688.
- Cream—
- and milk collection in Maine, economic study, Me. 406.
 - and milk collection routes, operating costs and returns, Me. 406.
 - churnability, relation to composition of butterfat, 379.
 - coffee and whipping, problems, 242.
 - consumption in Minneapolis, Minn. 714.
 - cooling experiments, 241.
 - Devonshire clotted, U.S.D.A. 525.
 - electrically refrigerated, manufacture of butter from, 241.
 - flash heating and cooling, 242.

Cream—Continued.

- flavors and viscosity, effect of pasteurization temperature, N.Y. State 379.
 - freezing effects, 525.
 - frozen, fat distribution in, 525.
 - grading for butter making, 241.
 - grading in Alberta and Washington, 242.
 - grading, methylene blue reduction test for, Minn. 684.
 - grading, sediment tests for, Okla. 684.
 - high acid, neutralizing for butter making, 524.
 - high quality, for butter making. U.S.D.A. 526.
 - homogenized, sediment in, Mich. 246.
 - intended for whipping, use of dry skim milk in, Mo. 101.
 - neutralization, 242, 380.
 - pasteurization, N.Y. State 682.
 - properties, effect of heat transfer rates, 524.
 - proteins, fermentation, 242.
 - samples, keeping quality, effect of preservatives, Ky. 95.
 - sour, bitter flavor in, W.Va. 680.
 - whipped, effect of dried skim milk, Mo. 525.
 - whipped, properties, effect of dry skim milk, Mo. 247.
 - whipping ability, effect of acidity, Wis. 526.
 - whipping, effect of triglycerides and fatty acids, N.J. 95.
 - whipping, success in, N.Y. State 680.
- Creameries, starters and starter making in, 686.

Creamery—

- equipment, care, 243.
- operations in New Brunswick, 714.
- Operators' Association's aims and problems, 243.
- waste on filters, purification, 117.
- water supplies, bacteriological and chemical studies, 524.

Creatinine excretion of animals and body weight, Mo. 824.

- Creatinuria in adolescent males, effect of administration of ephedrine sulfate, 570.
- Creeping Jennie, spread and control, Iowa 757.

Cremastus—

- flavoorbitalis*, biology, U.S.D.A. 819.
- new genus, description, 820.

Creoboter urbana, biology, 658.

Creosote—

- as internal-combustion-engine fuel, 399.
- oil for control of San Jose scale, 345.
- oil tests for San Jose scale and peach leaf curl, 78.

Cresylic acid sprays for aphid control, W.Va. 654.

Cricket—

- field, on cotton, 77.
- house, control, N.J. 74.

24476—35—6

Cricket—Continued.

- Mormon, notes, Mont. 807; U.S.D.A. 653.

Cronartium ribicola, see White pine blister rust.

Crop—

- acreage reductions and adjustments, N.C. 449.
 - data applicable to farm organization and management, 401.
 - index, weighted, 854.
 - nutrients, competition of soil organisms for, 19.
 - Protection Institute, progress, 634.
 - reports, U.S.D.A. 126, 271, 556, 859.
 - rotations, see Rotation of crops.
- Crops—see also Field crops, Forage crops, Root crops, and specific kinds.
- cash and feed, index numbers, Mich. 124.
 - effect of manganese deficiency, R.I. 27.
 - fertilizer mixtures for, N.C. 304.
 - fertilizer recommendations, S.C. 744.
 - green, ensilage, 516.
 - importance of phenological observations, 740.
 - in eastern Canada, cost of production, 404.
 - irrigated, rotation experiments, U.S.D.A. 759.
 - manure v. nitrogen carriers for, 35.
 - planning, relation to weather data, 447.
 - production, effect of climatic conditions, U.S.D.A. 759.
 - production, use of power, labor, and machinery in, Mo. 547.
 - returns to growers, effect of marketing agreements, U.S.D.A. 118.
 - yield and quality, effect of fertilizers. Utah 317.

Crossbill, squirrel, and great spotted woodpecker, mutual relations, 651.

Crotalaria—

- as green manure for tobacco, 324.
- culture experiments, Fla. 316.
- feeding value, Fla. 376.
- for pasture and silage, Fla. 316.
- seed, feeding value, Fla. 371.
- seed, toxicity for fowl, 391.
- spectabilis* seed poisoning in swine, 695.
- stem canker, notes, Fla. 347.
- susceptibility to nematodes, Fla. 346.
- variety tests, Ga.Coastal Plain 757; S.C. 759.

Crow cestode, cysticeroids of, 214.

Crow stomach worm hosts, 214.

Crown gall—

- bacteria, metabolic products, Wis. 489.
- experimental production on *Opuntia*, 499.

Crucifer clubroot—

- control, N.J. 60.
 - organism, wound infection and tissue invasion by, 494.
 - resistance, role of glucosides in, 495.
- Crucifers, destructive virus disease, 632.

- Crude fiber, *see* Cellulose.
 Cryolite, solvents for, 74.
Cryptochaetum grandicorne, biology and development, 816.
Cryptodiaportha, description, synonymy, hosts, and distribution, 489.
Cryptorhynchus cubae, new to United States, 818.
Cryptosporium minimum, notes, U.S.D.A. 195.
 Cryptovegetation, use of term, 596.
 Crystalline lens, ascorbic acid in, 283.
Ctenocephalides felis, *see* Cat flea.
 Cube products, use, U.S.D.A. 502.
 Cucumber—
 beetles, notes, Fla. 358.
 fruit development, vegetative and reproductive responses to, [N.Y.] Cornell 50.
 mosaic in Montana, U.S.D.A. 195.
 mosaic virus, neutralization by immune sera, 800.
 mosaic, yellow strains, isolation, 497.
 seedlings, effect of substance from ripe apples, 621.
 Cucumbers—
 culture, N.Y.State 329.
 disease resistant, selection and development, P.R. 195.
 fermentation studies, Mich. 157.
 fertilizer experiments, Ark. 768; P.R. 182.
 greenhouse, nutritional deficiencies, Ohio 48.
 response to fertilizers, S.C. 769.
 storage, 52.
 Cucurbit—
 downy mildew, Fla. 346.
 flies, control, 656.
 leaf beetle, biology and control, 230.
Cucurbita, particularly cultivated forms, N.Y.State 617.
 Cucurbits—
 breeding, Iowa 769.
 galerucid beetle injurious to, 665.
 Culicidae—
 and malaria in Philippines, 814.
 predators, 229.
Cunninghamella plaque method of measuring available phosphorus in soil, 745.
Cuphocera genus, revision, 663.
Curculio caryae, *see* Pecan weevil.
 Currants—
 classification on genetical basis, 778.
 size variation in, 777.
 Cut-over lands in Minnesota, State program for, 549.
 Cutworm—
 black, notes, Fla. 358.
 granulate, notes, Fla. 358.
 pale western, notes, Mont. 807.
 Cyanamide toxicity, prevention, 591.
 Cyanide poisoning in sheep and cattle, treatment, 253.
 Cyclamen—
 bacterial corm rot, notes, [N.Y.] Cornell 788.
 seed, production, [N.Y.] Cornell 782.
Cylas formicarius, *see* Sweetpotato weevil.
Cylindroiulus londinensis caeruleocinctus on strawberries, 506.
 Cyprus, geology and climate, 16.
Cyrtillia angustifrons, biology and larval forms, 229.
 Cysteine—
 determination, sources of error in, 9.
 oxidation, catalysis of, 151.
 separation from ascorbic acid, 443.
Cysticercus pisiformis, parasite of rabbits, immunity, 688.
 Cystine—
 deficiency, effect on utilization of energy-producing nutriment and protein, 371.
 determination, sources of error in, 9.
 in acid solution, stability, 291.
 in proteins of pasture plants, 581.
 in soybeans, 5.
Cytospora—
 canker of *Picea* spp., 630.
 cankers of *Populus*, Iowa 788.
 chrysosperma spores, resistance to low temperatures, 29.
 die-back of fruit trees, 789.
Dacus ciliatus, notes, 656.
Dacus spp., control, 656.
 Dahlia virus diseases, 630.
 Dairy—
 and State breed associations, functions and opportunities, 243.
 area in Delaware, economic readjustments in, 854.
 breed association, functions, 242.
 byproducts, manufacture, composition, and use for feed, U.S.D.A. 832.
 cattle and dairy cows, *see* Cattle and Cows.
 cost of production studies, 242.
 costs and returns in 1933, Mich. 269.
 Council, Washington State, educational program, 243.
 cows, Michigan, amounts and kinds of feed fed to, Mich. 405.
 equipment, coefficient of heat transfer of metals, 524.
 equipment, effect of alkalies and chemical sterilizers, 241.
 farming in Vermont, Vt. 123.
 feeds, vitamin A and carotene in, 523.
 glassware, inspection, N.Y.State 581.
 herd improvement associations, 242.
 husbandry in Italy, N.Y.State 680.
 industry, advertising health by, 243.
 industry, economic readjustments, Del. 551.
 industry of New Zealand, textbook, 552.
 machinery, development, 400.

Dairy—Continued.

- machinery, new developments, 241.
 - manufacture, review of recent books published on, 242.
 - plant efficiency, Vt. 110.
 - plants, number of micro-organisms falling from air in, 683.
 - production experiments at experiment stations, 243.
 - products, consumption in Minneapolis, Minn. 714.
 - products, cost of production, 243.
 - products in Europe, manufacture, 243.
 - products, index numbers, Mich. 124.
 - products, marketing in Germany, regulations, 857.
 - products, packaging, use of paper for, 243.
 - products, testing for fat, Pa. 831.
 - products under Agricultural Adjustment Act, 267.
 - products utilization campaigns, Michigan plan, 523.
 - products, value in diet, educating consumer to, 241.
 - program, 242.
 - rations, use of roughage in, U.S.D.A. 680.
 - Science Association, proceedings, 830.
 - science, fundamentals, treatise, 830.
 - shows, production record in, 375.
 - sires, *see* Sires.
 - situation and outlook, Okla. 707.
 - sterilization, chemical, latest developments in, 243.
 - sterilizers, Pa. 846.
 - structures, Calif. 700.
 - technology, research in, application of X-rays to, 524, 682.
 - utensils, sterilizing on farm, 242.
- Dairying—*see also* Creamery, Butter, Milk, etc.

institutions, International directory, 375.

Damping-off—

- galvanizing soil for control, N.Y. State 638.
- in seedbeds, zinc oxide for, N.Y. State 791.

Dams, small, design and construction for emergency conservation work, U.S.D.A. 111.

Dandelion greens, New York market prices, N.J. 124.

Daphnia as food for bass, propagation, [N.Y.] Cornell 807.

Date—

- decline disease, eradication, Calif. 634.
- palm, fruit growth and temperature, 627.
- palm tissues, parasitic action of *Omphalia*, 633.

Dates—

- chimera in, 170.
- Dairree, testing in Southwest, U.S.D.A. 54.

Dates—Continued.

- Deglet Noor, water injury, control, Calif. 634.
- soil and cultural requirements, Calif. 46.
- Death watch beetle, life history, 232.
- Deer and beaver transplantings, U.S.D.A. 500.
- Deer parasites and other diseases, Oreg. 73.
- Deficiency diseases, *see* Diet deficiency and specific diseases.
- Deiphobe* sp., biology, 658.
- Delphinium, *Sclerotium* stem rot of, 210.
- Dematium pullulans*, notes, 353.
- Dematophora* root rot, 633.
- Dendroctonus*—
 - brevicornis*, *see* Pine beetle, western.
 - frontalis*, *see* Pine beetle, southern.
- Dendrolimus pini*, ecology, 217.
- Department of Agriculture, *see* United States Department of Agriculture.
- Deporaus marginatus*, life history notes, 666.
- Dermaptera of Illinois, 658.
- Dermatitis—
 - circumscribed squamous crustated, of bovines in Dutch East Indies, 839.
 - in rats deprived of vitamin B₂, 566.
 - pellagra-like, in rats and vitamin G, 282.
 - ulcerous, of ruminants, relation to human diphtheria, 531.
 - verminosa bovis, proposed name, 840.
- Dermestes vulpinus*, *see* Hide beetle.
- Derris—
 - and molasses spray, effect on gladiolus thrips, 223.
 - and pyrethrum, difference in action against imported cabbage worm, 358.
 - insecticidal value, N.Y. State 360.
 - insecticides, toxicity to sucking and chewing insects, N.J. 75.
 - products, use, U.S.D.A. 502.
 - root residue, extracted, insecticidal properties, N.J. 76.
 - spp., tests, P.R. 174.
 - stored, coleopterous pests in Malaya, 817.
 - stored, insect pest control, 657.
- Desmia funeralis*, *see* Grape leaf folder.
- Devil's-shoestrings, potential source of rotenone and related insecticides, U.S.D.A. 504.
- Dew as factor of plant growth, 740.
- Dewberries, culture and disease control, Ill. 778.
- Dewberry—
 - anthracnose, control, N.J. 60, 69.
 - cane measurements, 341.
 - rosette in Louisiana, 346 La. 69.
- Diabetes, lower fat diet in, 893.
- Diabrotica*, *see* Cucumber beetles.
- Dialeurodes*—
 - citri*, *see* Whiteflies.
 - elbaensis* n.sp., description, 812.
 - kirkaldyi*, notes, 659.

- Dialeurodoides afer* n.sp., description, 812.
Diamondback moth, derris and pyrethrum dusts for, 228.
- Diaportha**—
crotalariae n.sp., notes, Fla. 347.
genus and its segregates, 489.
umbrina, notes, N.J. 60.
- Diaporthella*, description, synonymy, hosts, and distribution, 489.
- Diaporthopsis*, description, synonymy, hosts, and distribution, 489.
- Diaprepes abbreviatus*—
larval period, diapause portion, 655.
notes, 655; P.R. 216.
- Diarrhea, bacillary white, *see* Pulvorum disease.
- Diatom growth, effect of silicic acid, 152.
- Diatraea**—
cramboides, *see* Cornstalk borer, southern.
saccharalis, *see* Sugarcane borer.
sharinensis, biological studies, 218.
spp., notes, 655.
venosata, campaign against, 656.
- Dicalcium phosphate and bone meal as mineral supplements, relative value, [N.Y.] Cornell 830.
- Dicelis nira* n.sp., parasitic on earthworms, 214.
- Dichlorofluorescein for determination of chlorides in milk and dairy products, 524.
- Diet—*see also* Food and Nutrition.
and personality, treatise, 279.
and reproduction, 423.
deficiency disease—*see also specific diseases*.
in man, role of gastro-intestinal tract, 569.
of average family under present economic conditions, 870.
of infants, *see* Infants.
ratio of fat and carbohydrate in, effect on nitrogen excretion in feces, 874.
relation to dental caries, 137.
studies show need for national planning, U.S.D.A. 134.
- Diets**—
at four levels of nutrition and cost, treatise, 869.
high protein, and acid-base mechanism, 561.
selected by college students from a college cafeteria, 719.
- Digonichaeta setipennis*, introduction in Oregon, 74.
- Dikes for control of sand flies and salt marsh mosquitoes, 688.
- Dimorphotheca cuneata*, isolation of poisonous principle, 529.
- Dinoderus minutus*, pest of stored derris, 817.
- Dinoderus* sp., toxicity tests, 666.
- Diparopsis castanea*, notes, 365.
- Diphtheria**—
calf, isolation and culture of organism, 104.
- Diphtheria**—Continued.
calf, notes, Wyo. 694.
flagellate, in pigeons, 698.
human, relation to ulcerous dermatitis in ruminants, 531.
- Diplocarpon**—
earliana, mode of infection, 68.
rosae, notes, N.J. 60.
- Diplodia**—
damage to corn kernels, U.S.D.A. 633.
natalensis and *Penicillium digitatum* on oranges, combined effect, 802.
natalensis, notes, U.S.D.A. 69.
on strawberry roots, Fla. 346.
spp., notes, Fla. 346.
zeae extract, treatment of seed corn for seedling blight, Iowa 788.
zeae, notes, U.S.D.A. 488.
- Dips, disinfectants, and anthelmintics. U.S.D.A. 528.
- Diptera**—
aquatic, of North America, keys, [N.Y.] Cornell 510.
North American, families and genera, 228.
of medical and veterinary importance, revision, 815.
- Dipylidium caninum*, reactions of cat flea to, 664.
- Disease and parasitism, lectures on, 249.
- Diseases**—
deficiency, *see* Diet deficiency disease and specific diseases.
of animals, *see* Animal diseases and specific diseases.
of plants, *see* Plant diseases and specific host plants.
- Dishwashing by different methods, time and cost evaluation, Wash. 425.
- Disinfectants, anthelmintics, and dips. U.S.D.A. 528.
- Distemper, canine—
effect of irradiation, 390.
filtrable virus, pure cultivation, 536.
immunization, 390, 842, 843.
- Distillate oil burners, government tests, 853.
- Distillery byproducts, feeding value, U.S.D.A. 88.
- Doclostaurus maroccanus* in Sardinia, 658.
- Dodder, control, Tenn. 469.
- Dog fleas—
control, N.J. 74.
transmission experiments with yellow fever virus, 531.
- Dogs**—
feeding, Ala. 828.
fluorine injection into, effects, 689.
sledge, of Manitoba, fluke disease in, 257.
training and care, treatise, 236.
treatise, 536.
- Dolichopus ramifer* in a greenhouse, 501.
- Dominion Grain Research Laboratory, reports, 45
- Dothichiza* cankers of *Populus*, Iowa 788.

- Dothiorella* canker of poplar, symptoms, 789.
- Douglas fir, planting tests, Iowa 784.
- Dourine—
and prophylaxis, 102.
eradication, U.S.D.A. 528.
in South Africa, 534.
- Dove, barred ground, food and feeding habits, 805.
- Doves, toxicity of *Crotalaria* seed for, 391.
- Drainage—
by underground tile, P.R. 261.
systems, tile, studies, Minn. 393.
vertical, installation and operation, N.J. 700.
- Drains—
mole, durability, 539.
spacing on Missouri soils, Mo. 539.
- Dresses, ready-made, buying, quality guides, U.S.D.A. 285.
- Drought—
cartographic study, 741.
heat, and dust storms, record-breaking of 1934, 741.
of 1934, U.S.D.A. 447.
of 1934, effects on feed, forage, and livestock, U.S.D.A. 860.
- Drug products, analyses, Conn.[New Haven] 130.
- Drugs and foods, chemical examination, Me. 414.
- Dry land—
culture experiments, U.S.D.A. 759.
farming, rotation and tillage studies, Nebr. 758.
- Ducks—
mallard, hand-reared, for restocking of marshes, U.S.D.A. 72.
mallard, light phase in, 32.
wild, ecology, Iowa 804.
wild, losses among, 214.
wild, pathological changes encountered in, 538.
- Dumetella carolinensis*, host of *Plagiorhynchus formosus*, 214.
- Dust of insect origin, allergic response to, 359.
- Dust storms, drought, and heat, record-breaking of 1934, 741.
- Dusting—see also Spraying and specific crops.
mechanical means of projecting air for, N.J. 110.
- Dye absorption of cotton fibers, 572.
- Dyeing with natural dyes at home, U.S.D.A. 139.
- Dyes for bacteriostatic action, titration, 155.
- Dysdercus*, see Cotton stainers.
- Dysentery, chronic bacterial, see Johne's disease.
- Earwig, European—
fumigation in balled nursery stock, 361.
in Australia, 656.
present status, 654.
tachinid parasite, 74.
- Easter lily diseases, Fla. 346.
- Echinococcus* in dogs, 529.
- Ecology, agricultural, method of representing atmospheric conditions in, 456.
- Economic handbook of Pacific area, 269.
- Economics—
agricultural, see Agricultural economics.
extension and Agricultural Adjustment Administration, 853.
with applications to agriculture, treatise, 401.
- Economy, national, in Argentina, plan for safeguarding, 856.
- Ectoposocus parvulus*, bionomy, 217.
- Education—
agricultural, see Agricultural education.
vocational, see Agricultural education, vocational.
- Eelgrass disappearance, effect on waterfowl and industry, U.S.D.A. 30.
- Egg—
albumin, see Albumin, egg.
fertilized, as a physicochemical system, 679.
production—see also Hens, laying.
and maturity, effect of selection and breeding, Iowa 822.
annual, interval as index, W.Va. 671.
breeding for, 171; Utah 371.
effect of poultry housing, Ark. 846.
of one hen, feed purchasing power, Mo. 122.
poultry housing and lighting for, Wyo. 374.
relation to anatomical measurements, 239.
relation to date of sexual maturity, Mo. 514.
seasonal variations in Philippines, 679.
trends in, effect of proteins in diet, 678.
value of meat scrap and milk combinations, Iowa, 822.
vitamin A requirements of hens for, Tex. 238.
winter, effect of artificial light Mo. 514.
- yolk color, relation to pimiento feeds, Ga. 93.
- yolk, iron and copper in, effect of cod-liver oil, Ky. 88.
- yolks, discoloration, cause, 239.
- yolks, light, medium, and dark. vitamins in, Mo. 564.
- yolks, vitamin D in, 522.
- Egg-laying contests. New Jersey policy. N.J. 521.
- Eggplant—
storage, 52.
Verticillium wilt and fruit rot, N.J. 60.

Eggplant—Continued.

Verticillium wilt, control, 497.

Verticillium wilt, seed transmission, 800.

Eggplants—

disease resistant, selection and development, P.R. 195.

fertilizer experiments, P.R. 182.

results from paper mulch tests, effect of soil type, 183.

Eggs—

broken-out, preserving, U.S.D.A. 436.

developing, effect of increased atmospheric pressure, apparatus for study 679.

enzyme studies, U.S.D.A. 436.

from hens on different diets, composition of proteins, 829.

handling on farm, N.J. 374.

hatchability—

and quality, effect of rations, Mo. 514.

and weight, effect of proteins in diet, 678.

effect of antecedent egg production, 370.

factors affecting, Mo. 515, 519.

relation to time of laying, 173, 240.

vitamin G supplements for, Wis. 515.

increasing vitamin B and G in, Wis. 515.

incubation, *see* Incubation.

keeping qualities in cold storage, Ark. 821.

laid by a hen, feed purchasing power, Mo. 514.

Louisiana, keeping quality, La. 94.

marketing in north of England, 855.

New Mexico, market qualities, N.Mex. 553.

New York wholesale market, interrelation of daily prices and supply, [N.Y.]Cornell 270.

nutritive value, N.J. 561.

Ohio, market movements, Ohio 122.

oil treatment of shell, U.S.D.A. 436.

oiled by vacuum carbon dioxide method keeping quality, U.S.D.A. 87.

physiological and hatchability studies, U.S.D.A. 514.

prices and egg-feed ratio, Wash. 122.

prices and index numbers, Mich. 124.

quality, effect of breeding and feeding, U.S.D.A. 87.

quality, effect of methods of packing, 94.

quality, effect of shaking, 829.

quality, factors affecting, Calif. 671.

quality, relation to retail price in New York City, [N.Y.]Cornell 408.

size, inheritance, N.J. 88.

statistics of southern California, Calif. 410.

tremulous air cells in, cause, 680.

Eggs—Continued.

turkey, incubation, humidity and weight loss in, Nebr. 94.

vitamins in, effect of diet, Iowa 822.

yield and weight, effect of age, W.Va. 671.

Eimeria—

of pigeon, periodicity in oocyst production, 688.

tenella, development of resistance in poultry to, 688.

Electric—

brooding, Mo. 539.

cleaners, comparative ability to remove dirt from rugs and carpets, 574.

Electricity—

for heating hotbeds, Calif. 400.

for plant treatment, 399.

for soil heating, 399, 852; Idaho 110. on Nebraska farms, Nebr. 851.

use on farms, Calif. 700.

Electrification, rural, report on C.W.A. national survey, U.S.D.A. 702.

Electrode system, glass, design and construction, 155.

Elevators—

farmers', membership problems and relations, Iowa 555.

farmers', of Oklahoma, financial operations, Okla. 715.

Ohio farmer-owned, financial operations, 407.

Eltopia fiscellaria, *see* Hemlock spanworm.

Elm—

American, mosaic-like disease, Iowa 788.

Lark beetle, European, data, U.S.D.A. 653.

bark beetle, smaller European, notes, 819.

disease, Dutch—

Acarina as possible vectors, 85.

around New York, campaign against, U.S.D.A. 70.

at Norfolk, Va., U.S.D.A. 488.

eradication, U.S.D.A. 634.

in Connecticut, 803.

in Indiana, U.S.D.A. 346.

in United States, status, U.S.D.A. 70.

notes, U.S.D.A. 633.

transmission by bark beetles, 819. disease fungus, relation to bark beetles, U.S.D.A. 653.

diseases in America, 631.

leaf beetle, Idaho 74.

scolytids, scouting for, 74.

wilt fungi, positive infection trials, 356.

Elms—

British, status and nomenclature, 628. performance, Nebr. 769.

Embryology and genetics, treatise, 31.

Embryonic material in abnormal environments, behavior, 464.

Emmer, variety tests, U.S.D.A. 759.

- Empoasca fabae*, see Potato leaf hopper.
- Empusa*—
aphidis attacking potato and spinach aphids, N.Y.State 654.
sphaerosperma, notes, 73.
- Encarsia elegans*, notes, 812.
- Encephalomyelitis—
equine—
eastern, western, and Argentine virus, 842.
effect of irradiation, 390.
in Kansas, 841.
insect transmission, Utah 359, 382.
notes, U.S.D.A. 528.
outbreak in Indian cavalry regiment, 535.
propagation of virus after intranasal instillation in guinea pig, 841.
properties of virus, 389.
summary, 257.
transmission by mosquitoes, 695.
transmission experiments with blood-sucking dipterans, 389, 390.
virus, inoculation of developing chick embryo with, effect, 842.
virus of Argentine, active immunization and comparison with California virus, 842.
virus, resistance in mice to intranasal infection with, 535.
- infectious, of horses and mules, Calif. 689.
spontaneous, of mice, new virus disease, 530.
studies, Colo. 837.
- Endopsylla* n.sp., biology, 225.
- Engineering—
agricultural, institutions, international directory, 699.
agricultural, material, system of classification, 699.
civil, handbook, 701.
research at University of Oxford, 544.
Rural, International Congress, 896.
- Engines—
compression-ignition, photographic study of combustion in, 263.
gasoline and Diesel, detonation in, analysis, 114.
internal-combustion—
detonation and thermal decomposition of hydrocarbons, 703.
flame temperatures in, measurement, 113.
theory, analysis, and design, treatise, 399.
- Enteritis—
chronic, see Johne's disease.
feline infectious, 843.
paratuberculous, of sheep, Calif. 689.
- Enterohepatitis, infectious, see Blackhead.
- Enterotoxemia—
infectious, of sheep, 534.
of sheep in Palestine, 694.
- Entomological equipment and methods, manual, 215.
- Entomology—see also Insects.
and helminthology, veterinary, treatise, 528.
economic, accomplishments in Philippines, 806.
field experimentation in, technic, 500.
forest, in district of Lunz, 217.
forest, problems in Netherlands East Indies, 218.
historical background in California, 501.
Indian, lists of publications, 655.
- Entomograph for recording appendicular or locomotor activity of insects, 215.
- Enzyme action at low temperatures, N.Y. State 581.
- Eperythrozoon wenyonii*, new blood parasite of calf, 387.
- Ephestia*—
cautella, see Fig moth.
elutella, see Tobacco moth.
figulilella, exclusion from drying fruit, 365.
figulilella, studies, 73, 365.
kuehniella, see Flour moth, Mediterranean.
spp., notes, 360.
- Ephestiodes nigrella*, notes, 365.
- Epicauta marginata*, see Blister beetle, margined.
- Epicordulia*, host of *Prosthogonimus macrorchis*, Minn. 392.
- Epidemiology and prophylaxis, 102.
- Epilachna corrupta*, see Bean beetle, Mexican.
- Epithelioma virus—
and vaccine virus, identity, 250.
vaccination through rabbit passage, 250.
- Epitrix cucumeris*, see Potato flea beetle.
- Ergosterol—
and irradiation products, constitution, 587.
and vitamin D, 732.
infrared absorption spectrum, 7.
irradiated—see also Viosterol.
cod-liver oil, and butter, antirachitic factor, differentiation, 685.
v. cod-liver oil for chicks, 237.
v. irradiated yeast for vitamin D milk production, 245.
- Ergosteryl sulfate salts, preparation and antirachitic activity, 443.
- Eriophyes gossypii*, see Cotton blister mite.
- Eriosoma lanigera*, see Apple aphid, woolly.
- Erosion, see Soil erosion.
- Erysipelas, swine, diagnosis by new blood test, U.S.D.A. 102.
- Erysipelothrix rhusiopathiae*, horses hyperimmunized with, hematology, 107.
- Erysiphe*—
cichoracearum on blue Agathea daisy, 648.

Erysiphe—Continued.

graminis hordei, physiology, [N.Y.] Cornell 199.

graminis tritici, notes, 793.

polygoni, notes, 351, 493; U.S.D.A. 640.

Erythraeus aonidiphagus n.sp. on lemon trees, 233.

Erythroneura—

comes, see Grape leaf hopper.

ziczac, notes, Mont. 807.

Erythrosin, effect on growth hormone in roots, 597.

Escarole, New York market prices, N.J. 124.

Escherichia coli cultures, oxidation-reduction potentials and ferricyanide reduction, 583.

Etharsanol for surra treatment, tests, 535.

Ethylene—

lubricating oils from, 703.

treatment of fruits, health problems, 869.

treatment of tobacco, 614.

Etiella zinckenella, see Bean pod borer, lima.

Eumerus tuberculatus, see Bulb fly, lesser.

Euplectrus platyhyphenae, notes, 813.

Euproctis chrysorrhoea, see Brown-tail moth.

Eurotium herbariorum spores, resistance to low temperatures, 29.

Eurytoma tyloclermatis, notes, 513; U.S.D.A. 653.

Euscelis striatulus, notes, N.J. 75.

Euschistus variolarius, biology, 224.

Eutermes exilis, notes, 506.

Eutettia tenellus, see Beet leaf hopper.

Evaporation rate from soil, 12.

Evergreens, propagation under different temperatures, 784.

Ewes—see also Sheep.

acid-base balance during and after pregnancy, 692.

faulty winter feeding, effect on lambs, 519.

monthly growth of fleece in India, 676.

pregnant, acidosis in, Ky. 88.

types, comparison, Ind. 90.

wool, effect of wintering, Utah 371.

Exanthema, vesicular, of swine, proposed name, Calif. 689.

Exanthematous typhus, transmission experiments by ticks, 821.

Exeristes roborator, notes, U.S.D.A. 653.

Experiment fields, outlying, results, Mo. 448.

Experiment stations—see also Alaska, Arkansas, etc.

Federal legislation, rulings, and regulations affecting, U.S.D.A. 141.

Experimental—

institutions in hot countries, international directory, 286.

trials, statistical soundness in, numbers of individuals required, 460.

Eyes of ox, vitreous humor, ascorbic acid in, 422.

Fabrics—see also Textiles.

absorption of water by, determination methods, 733.

industrial, handbook, 893.

underwear, properties of, 284.

Families—see also Farm families.

average rural, feeding under present economic conditions, 870.

city, opportunity on Wisconsin farms, Wis. 557.

Family—

incomes and farm organization in Knott County, Ky. 556.

living in agricultural counties, expenditures, S.C. 573.

Farm—

accounts, statistical analysis, 862.

animals, see Livestock and Animals.

appraisals, standards, 713.

building losses due to wind and fire. Iowa 846.

buildings, combination, Mo. 539.

buildings, insulation, designing, 546.

buildings, studies, Mo. 550.

carts, Dunlop pneumatic equipment for, tests, 851.

commodities, sanitation in relation to production, 546.

credit, see Agricultural credit.

debt adjustment activities, history, 853.

debt problems, legislature approaches, 853.

economics research in England, 266.

800-acre diversified, estimated returns under four different plans, S.Dak. 269.

enterprises, man-labor requirements. Pa. 855.

families—see also Families.

clothing purchased by, [N.Y.] Cornell 733.

food consumption, S.C. 870.

growth, relation to activities, N.C. 273.

in Genesee County, New York, mobility, [N.Y.] Cornell, 128.

of Illinois, cost of living, Ill. 285.

stages of development, Wis. 717.

home, closets and other storage arrangements, U.S.D.A. 734.

housing in Iowa, status, Iowa 557.

housing survey, U.S.D.A. 574.

implements, upkeep, Md. 110.

improvements, relation to earnings, Mo. 547.

income estimates, monthly, seasonal variation, 854.

inventory values for farm organization and efficiency studies, basis, 854.

land prices in Nebraska counties, history, Nebr. 549.

land values, Iowa, 854.

machinery, see Agricultural machinery.

management—

and agricultural economist, 267.

application of simple farm records in, Iowa 854.

Farm—Continued.

- management—continued.
 - crop manual, 401.
 - cropping records for, 266.
 - practices and returns in Big Horn Basin, Wyo., 710.
 - problems, value of physical data, 266.
 - studies, W.Va. 710.
- mortgage loan experience in southeast Alabama, Ala. 862.
- mortgage loan policy and grading of land security, 862.
- mortgages, delinquent, handling, 853.
- organization—
 - and family incomes in Knott County, Ky. 556.
 - and management in Greeley area, Colo. 854.
 - and management in southern Iowa, Iowa 854.
- power, efficiency of use, 113.
- price data, reliability and adequacy, S.Dak. 125.
- prices and costs of Michigan, 1910–1934, Mich. 124.
- prices, index numbers, Calif. 410.
- products, *see* Agricultural products.
- profits, rate of turn-over of capital as factor, 267.
- property in Ontario, assessment, 269.
- real estate—
 - of South Carolina, assessed and actual value, S.C. 855.
 - situation in Missouri, Mo. 547.
 - tax delinquency in South Carolina, S.C. 270.
 - values in Minnesota, Minn. 403.
 - values in New England, 713.
 - values in Ohio, semiannual index, 404.
- size and business cycle., 854.
- structures, U.S.D.A. 699.
- taxation, *see* Taxation and Taxes.
- tenancy—*see also* Land tenancy.
 - in North Carolina, 854.
- transport by motor lorry, 266.
- v. village living in Utah, Utah 127.

Farmer contracts, 242.

Farmers—

- American, plan for bringing economic equality, Okla. 707.
- business organizations in Canada, 714.
- effect of inflation, 711.
- occupational mobility, S.C. 129.

Farmhouses—

- low-cost plans, U.S.D.A. 428.
- plans and building problems, Mich. 428.

Farming—*see also* Agriculture.

- along Mediterranean Sea, N.Y.State 429, 680.
- areas, major and minor type, Iowa 854.
- areas, marginal, effects of back-to-the-land movement, 854.
- dry land, *see* Dry land farming.
- efficiency, relation to tenant-right valuation, 266.

Farming—Continued.

- part-time, in Washington, Wash. 709.
- part-time, status and possibilities, Calif. 402.
- types, Wash. 119.
- types in Idaho, Idaho 118, 401, 861.
- types in Washington, nature and distribution, Wash. 708.

Farms—

- electricity on, *see* Electricity.
- in spring wheat area, economic study, S.Dak. 268.
- large, medium, and small, estimated returns from, S.Dak. 268.
- mechanized, cultivation costs, 266.
- mechanized, survey in Great Britain, 855.
- mid-Devon, changes in rents, 266.
- of northwestern Iowa, records and accounts, Iowa 854.
- power, labor, and machinery costs on, Mo. 539.
- selecting, suggestions for, Minn. 713.
- selling and not selling baby chicks, labor incomes on, [N.Y.]Cornell 855.
- Farnham House Laboratory, work of, 807.

Fasciola—

- hepatica*, campaign against, 840.
- magna*, campaign against, 840.

Fat in human milk, 278, 872.

Fat, shortening value, factors affecting, 866.

Fats—*see also* Oils.

- cooking, frying quality, U.S.D.A. 560.
- edible, problem in Germany, U.S.D.A. 121.
- food, effect on milk fat and blood fat of cows and goats, [N.Y.]Cornell 830.
- marketing in Germany, regulations, 857.
- nutritional value, 413.
- production, trade, and consumption, 1912–33, U.S.D.A. 121.
- rancidity, relation to light of various wave lengths, 867.
- sparing action on vitamin G, 890.

Fatty acids—

- hydroxylated, acetyl values, 444.
- unsaturated, vital need of body, 874.

Feces, metabolic nitrogen of, relation to body weight and food intake, 873.

Federal organizations, new, structure and functions, 429.

Feeding experiments—*see also* Cows, Pigs, etc.

- comparative, by variance and covariance methods, analysis, 85.
- comparative, use of method of partial regression in analysis, 85, 373.

Feeding stuffs—

- amino acids in, 526.
- analyses, Vt. 89, 673.
- effects of 1934 drought, U.S.D.A. 860.
- inspection and analyses, Ind. 88; Ky. 517; Me. 372; N.H. 517; N.J. 89; R.I. 89.

- Feeding stuffs—Continued.
 mixing, bin method, Idaho 117.
 proteins, nutritive value, 523.
 usefulness, effect of plane of nutrition,
 Mo. 515.
 vitamin E in, Nebr. 97.
- Feijoa, varieties and botanical characters,
 627.
- Feltia annexa*, see Cutworm, granulate.
- Fence post wood, preservative treatments,
 Ark. 846.
- Ferrous metals in farm machinery parts,
 alloying and heat treatment, 544.
- Fertilizer—
 experiments, see *special crops*.
 requirements of soils, see *Soils*.
 salts, physical constants, U.S.D.A. 448.
- Fertilizers—
 acid-forming mixed, danger, S.C. 744.
 analyses, Ky. 25; S.C. 25; Vt. 25.
 analyses, interpreting with reference
 to sources of nitrogen, N.J. 304.
 briquetting, 21.
 concentrated, and mechanical place-
 ment, U.S.D.A. 448.
 crop response to, determination, 747.
 effect on crops and soil conditions un-
 der various rotations, Iowa 743.
 inspection and analyses, Conn.[New
 Haven] 592; Ind. 25; Me. 592; N.J.
 592; R.I. 456; Tex. 592.
 manufacture and use, U.S.D.A. 21.
 mixed, preparation, U.S.D.A. 448.
 penetration into soil, Ark. 768.
 placement tests, 315; Md. 13; U.S.D.A.
 699.
 reduced costs, U.S.D.A. 735.
 without filler, value, U.S.D.A. 21.
- Fescue, Chewings, method of shipping seed
 from New Zealand, U.S.D.A. 605.
- Fiber—
 crops, breeding and other research, 606.
 crops, culture experiments, Fla. 316.
 crude, see *Cellulose*.
 plants, annual bast, fiber quality and
 characteristics, 598.
- Fibers, fast dyes of, U.S.D.A. 436.
- Field—
 crops—see also *Crops*, *Forage crops*,
Root crops, etc.
 for Imperial Valley, Calif. 34.
 experiments, long-continued, soil study,
 590.
 experiments, testing reliability of an
 average, 756.
 plat experiments, border effect in, 606.
- Fig—
 disease, new, in Louisiana, 632.
 insects, stimulation, 73.
 mosaic in California, 630.
 moth, infestation of stored cocoa by,
 666.
 root disease in California, 650.
 trees, anomalous, 626.
- Figs—
 studies, Calif. 616.
 variety tests, Ga.Coastal Plain 768.
- Filberts—
 size and filling, relation to leaf area
 and shoot growth, 484.
 variety tests, Mo. 476.
- Filtration apparatus, stainless steel high-
 pressure, 155.
- Fir, Douglas, life of seed in forest floor, 487.
- Fire blight—
 and winter injury, [N.Y.]Cornell 788.
 control, 346; Calif. 634.
 relation to bees, 498, 631, 654.
 relation to nectar and rain, 68.
 resistance of rosaceous plants to, 209.
 631.
 spread, importance of weather condi-
 tions, Calif. 634.
 studies, Wis. 489.
- Fires, forest, see *Forest fire*.
- Fireworm, control, N.J. 75.
- Fish—see also *specific kinds*.
 food, studies, Oreg. 72.
 hatchery diseases, control, [N.Y.]Cor-
 nell 807.
 liver oils, vitamin A in, 281, 564.
 liver oils, vitamin D in, two forms,
 888.
 meal as food for clothes moths, 74.
 meals for chicks, comparison, Wyo. 671.
 meals, nutritive value, effect of method
 of manufacture, 672.
 of Oregon, diseases, Oreg. 73.
 oils, absorption spectra, relation to
 constituents, 584.
 poisoning plants, U.S.D.A. 502.
- Flavines, distribution, isolation, and vita-
 min activity, 279.
- Flax—
 culture in Imperial Valley, Calif. 34.
 diseases in Arizona, key, Ariz. 346.
 experiments in Imperial Valley, Calif.
 606.
 fertilizer, retting, and hackling tests,
 U.S.D.A. 605.
 fiber, culture and preparation, U.S.D.A.
 39.
 fiber, test, S.C. 759.
Fusarium wilt resistance, inheritance,
 639.
 response to environment, U.S.D.A. 605.
 rust, heterothallism in, 633, 796.
 seed and fiber, breeding, U.S.D.A. 605.
 seed, rotation experiments, U.S.D.A.
 759.
 seed, variety tests, U.S.D.A. 759.
 types and varieties, oil produced
 from, 40.
 variety tests, U.S.D.A. 605.
- Flaxseed—
 mercurial treatment, Iowa 788.
 production and imports, 410.
- Fleas—
 and anemia in foxes, 539.
 control, Conn.[New Haven] 429.
- Flies—
 blood-sucking, on livestock, repellents
 for, Mo. 501.
 house, see *Houseflies*.

Flies—Continued.

- in Denmark, development and control, 664.
- insecticide spray tests for, 218.
- musoid, incubation period of eggs, effect of temperature, 663.
- of genus *Cuphocera*, 663.
- olfactory responses in new type olfactometer, 367.
- white, *see* Whiteflies.
- Floods and accelerated erosion in northern Utah, U.S.D.A. 541.
- Floor panels with stressed plywood coverings, U.S.D.A. 543.
- Flours—
 - concrete, low-cost, new ideas in construction, 543.
 - made with precast concrete joists, load capacity tests, 542.
- Flora—*see also* Plants and Vegetation, of Russia, 459.
- Florida Station, report, 429.
- Flour—*see also* Bread.
 - beetle, confused—
 - growth of populations, mathematical theory, 817.
 - in stored rice, control, 75.
 - metathetically in larvae, 665.
 - relative efficiency of fumigants, 77.
 - colloids, fermentation response and fermentation tolerance, 867.
 - moth, Mediterranean, notes, 365; U.S.D.A. 653.
 - moth, Mediterranean, parasite, food habits and flight experiments, 232.
 - wheat, determination of amino acids in, 445.
- Flours, native, of Puerto Rico, utilization, P.R. 150.
- Flower—
 - bud maggot, notes, 75.
 - crops, effect of cheesecloth enclosures, 343.
 - gardens, color combinations for, 192.
 - thrips, Florida, notes, Fla. 358.
 - thrips, life cycle compared with other thrips, 506.
 - thrips on cotton seedlings, 77.
- Flowers—*see also* Plants, flowering, and Plants, ornamental.
 - culture, Ohio 48.
 - culture, application of probable error concept, 782.
 - cut, keeping quality, Ohio 48.
 - keeping qualities, effects of storage in gases at low temperatures, 783.
 - photoperiodism studies with, [N.Y.] Cornell 782.
- Fluke—
 - disease of sledge dogs in northern Manitoba, 257.
 - oviduct, of domestic fowls, 392.
- Flukes, cause of proventriculitis in chickens, 537.
- Fluorides, effects of ingestion, Iowa 866.

Fluorine—

- compounds, toxicity, 878; U.S.D.A. 436.
- containing insecticides, U.S.D.A. 502.
- ingestion, effect on dairy cattle, 523.
- ingestion, effect on nutritional qualities of milk, 378.
- injection into dogs, effects, 689.
- toxicosis, effect on calcification of bones and teeth, 879.
- Foals deprived of colostrum, horse serum for, U.S.D.A. 87.
- Fodder crops, *see* Forage crops.
- Fomes pini*, biology, 649.
- Food—*see also* Diet.
 - allergy, 424.
 - allergy, relation to gastro-intestinal disorders, 891.
 - and drug control, U.S.D.A. 735.
 - and Drugs Act, enforcement work, U.S.D.A. 560.
 - and health, treatise, 559.
 - and nutrition studies, Fla. 413.
 - and sleep, experiments with, 872.
 - chemistry, Iowa Station researches in, Iowa 739.
 - imports into Great Britain, changes in volume, 855.
 - products, analyses, Conn.[New Haven] 130.
 - purchases, family, adequacy, shortened method for calculating, 718.
 - sources and factors affecting consumption in borough of State College, Pennsylvania, Pa. 861.
 - supply, national, U.S.D.A. 861.
- Foods—
 - acid ash and alkaline ash, effect on acid-base equilibrium of man, 723.
 - and drugs, chemical examination, Me. 414.
 - canned, *see* Canned foods.
 - dried, public health aspects, 868.
 - enzyme studies, U.S.D.A. 436.
 - naturally occurring arsenic in, toxicity, 878.
 - oxalic acid in, 875.
 - Philippine, vitamins in, 282.
 - rancidity in, light factor in, U.S.D.A. 7.
 - used in municipal hospital, iron in, 724.
- Foot-and-mouth disease—
 - fixed virus types, 691.
 - virus and virus of vesicular stomatitis, differentiation, 691.
- Foot—
 - length, inheritance, 170.
 - rot in sheep, 106.
 - rot in sheep and cattle, treatment, Calif. 689.
- Forage—
 - and grassland crops in Thuringia, Czechoslovakia, and Hungary, 174.
 - crops, culture in Imperial Valley, Calif. 34.
 - crops, drying, U.S.D.A. 699.

Forage—Continued.

- crops, field curing methods, effects, 593.
- grasses for hogs, 370; Nebr. 822; S.C. 823.
- crops, variety tests, Ga.Coastal Plain 757; Nebr. 758.
- effects of 1934 drought, U.S.D.A. 860.
- grasses, *see* Grasses.
- green, loss of nutrients in conservation by different methods, 516.
- green, methods of preserving, 831.
- immature, harvesting for drying, Vt. 110.
- mixtures, tests, 35; Idaho 35.
- plants, variety tests, U.S.D.A. 605.
- poisoning, *see* Livestock poisoning.
- Plants, poisonous, and specific plants.

Forest—

- canopy, hardwood and softwood, rainfall penetration, 297.
- canopy, weather beneath, effect of stand density, 194.
- fire breaks, shaded, 488.
- fire, control roads and motorway lines in Lake States Region, U.S.D.A. 55.
- fire retardant, calcium chloride as, 488.
- fires in Florida, control, U.S.D.A. 55.
- insects, data, U.S.D.A. 653.
- insects, survey, Iowa 806.
- land, cultivation, calcium and magnesium losses from, 194.
- litter, acidity, antacid buffering, and nutrient content, [N.Y.]Cornell 300.
- litter, macrofauna, 217.
- management in Northwest, U.S.D.A. 55.
- News of Ohio, Ohio 195.
- nursery, sampling, 486.
- plantations, establishment and development, [N.Y.]Cornell 784.
- planting stock, improved production, [N.Y.]Cornell 784.
- products, damage by fungi, 630.
- reproduction, effect of mice and snowshoe rabbits, U.S.D.A. 500.
- seeds, repellents for treating to prevent rodent consumption, Pa. 785.
- soils, effect of burning, 161.
- soils, moisture and pH studies, 300.
- soils, organic, bibliography, U.S.D.A. 745.
- species, fire resistance, 57.
- trees, *see* Trees.
- types in Adirondack region, [N.Y.]Cornell 785.
- types, original, of southern New England, 785.
- yield tables, American, stand-basal area curves in, 486.

Forestry—

- in Ireland, 55.
- research, U.S.D.A. 628.
- social and economic aspects, U.S.D.A. 735.

Forests—

- and rainfall, 12.
- effect on air temperature, 298.

Forests—Continued.

- Mediterranean, comparative immunity from parasitical insects, 218.
- of France, resistance to insects, 218.
- of Nebraska, effect of thinning, U.S.D.A. 55.
- of Pennsylvania, composition, effects of severe drought, Pa. 785.
- results of free use provision, U.S.D.A. 55.
- selection method of cutting, value, U.S.D.A. 55.
- temperature in, vertical distribution, 447.

Forficula auricularia, *see* Earwig, European.

Formaldehyde—

- acidity and end-point in formol titration, 441.
- dust, use on vegetable seedlings, 632.

Foulbrood—

- American, spread, 666.
- diseases of bees, papers on, 819.

Fowl—

- cholera in Greece, 258.
- mite, northern, control, 820.
- paralysis, *see* Paralysis.
- pest and cell-inclusion disease, differential diagnosis, 391, 697.
- pest and Newcastle disease viruses, differentiation, 845.
- pest experiments, 699.
- pest in Egypt, 537.
- pest outbreak in New Jersey, 109.
- pest, use of vaccines against, 102.
- pest virus, culture, 537.
- pest virus, size, 697.
- pox control in chicks, Hawaii 391.
- pox immunization, comparison of fowl pox and pigeon pox virus vaccines, 108.
- pox in Greece, 258.
- pox studies, Utah 382.
- pox, transmission by bloodsucking insects, [N.Y.]Cornell 807.
- typhoid, breeding for resistance, Iowa 843.
- typhoid in Greece, 258.
- typhoid in Kenya Colony, 110.

Fowls—*see also* Chickens, Hens, Poultry, etc.

- blood groups in, inheritance, 603.
- cannibalism among, nature, 390.
- digestive tract, H-ion concentration, 843.
- dwarfism in, inheritance, 171.
- embryonic growth rates, effect of incubation temperature, Iowa 755.
- embryonic lethal characters in, La. 603.
- male, effect of X-rays on sex characters, 679.
- rachitic, effect of ultraviolet irradiation, 828.
- red blood cells, agglutinogens in, 463.
- retarded feathering in, 172.

Fowls—Continued.

- table, new Dutch breed, North Holland Blue, 829.
- wild, far-flying, and their foes, 652.

Fox cubs, outbreak of leptospiral jaundice in, 393.

Foxes—

- blood of, studies, 804.
- feeding methods, U.S.D.A. 500.
- food habits, Iowa 804.
- internal parasites and feeding, Wis. 529.
- red, in New York and New England, food of, 804.

Foxgloves, meiosis in, Pa. 755.

Fragaria—

- hybrids, karyologic and genetic studies, 754.
- spp. hybridizations, 169.

Frankliniella—

- fusca*, see Tobacco thrips.
- gossypii* on citrus, 357.
- insularis*, notes, 218; Fla. 358.
- tritici*, see Flower thrips.

Frauenfeldia rubricosa, biology and larval forms, 229.

Frogs and toads, handbook, 500.

Frogs, culture, commercial aspects, treatise. 213.

Fructose administration, effect on blood sugar, 724.

Fruit—

- bark beetles and winter injury, N.Y. State 666.
- beetle, dried, stimulation, 73.
- embryos, artificial culture, N.Y.State 617.
- farm management in Hudson Valley, [N.Y.]Cornell 855.
- flies, marking for migration studies, new method, 664.
- flies, notes, 656; P.R. 216.
- flies of genus *Anastrepha*, classification, 664.
- flies, West Indian, eradication from island of Key West, U.S.D.A. 653.
- fly in Queensland, spraying experiments for control, 663.
- fly, Mediterranean—
 - artificial food medium, 358.
 - biology and control, 663.
 - in Hawaii, U.S.D.A. 653.
 - in infested fruit, effect of low temperatures, 366.
 - in Western Australia, 656.
 - lethal effect of sea water, 366.
 - oviposition punctures, relation to premature dropping of citrus fruits, 366.
 - parasites, shipping, feeding, and rearing, 369.
- fly, Mexican—
 - notes, U.S.D.A. 653.
 - parasite control, U.S.D.A. 653.

Fruit—Continued.

- fly, Mexican—continued.
 - quarantine work with, U.S.D.A. 653.
 - studies, U.S.D.A. 816.
- fly situation in Mexico, 654.
- industry, relation to experiment station work, 331.
- juices, preparation, Calif. 719.
- juices, studies, N.Y.State 581.
- moth, dried, notes, 365.
- moth, oriental—
 - biological control, N.Y.State 654.
 - control, possibilities of parasites, 358.
 - in Maryland, Md. 507.
 - introduction of parasites, U.S.D.A. 652.
 - on peach, 656.
 - parasite control, U.S.D.A. 653.
 - parasites, effect of use, N.Y.State 667.
 - parasites, supplying to Connecticut peach growers, 216.
 - pupal parasites, 80.
 - studies, N.J. 74; S.C. 807.
- pest control program in Connecticut, 216.
- rootstocks, testing for resistance to root knot nematode, Calif. 634.
- russetting, cause and control, Ohio 47.
- shape, development, types of genetic control over, 462.
- shipments, protection from freezing, U.S.D.A. 616.
- soils, differentiating, method, [N.Y.] Cornell 773.
- tree leaves, activity, [N.Y.]Cornell 773.
- tree little leaf or rosette, 478.
- tree seeds after-ripening, effect of low temperatures, 478.
- trees, alternate bearing, prevention, Ohio 47.
- trees, budding, use of rubber strips in, 332.
- trees, *Cytospora* die-back, symptoms, 789.
- trees, grafting, whip-and-tongue method, 332.
- trees, hardness in, factors determining, Mo. 476.
- trees, hardy stocks for, 333.
- trees, injection, 332.
- trees, nitrogenous and carbohydrate materials in, seasonal cycles, 775.
- trees, opening of buds, effect of rest period, 188.
- trees, root penetration on heavy silt loam soils, [Okla.]Panhandle 618.
- trees, seasonal cycles of nitrogenous and carbohydrate materials, 479.
- trees, spraying while in bloom, effect on set of fruit, [N.Y.]Cornell 788.
- trees, tests, Fla. 327.

Fruit—Continued.

trees, training, N.Y.State 617.
washer, design and construction,
[N.Y.]Cornell 846.

Fruits—see also Orchards, Apples, Peaches,
etc.

and fruit products, effect on alkaline
reserve of blood, Calif. 719.
and marketing facilities in Reading
and Wilkes-Barre, Pa. 855.
bramble, culture and disease control,
Ill. 778.
breeding, N.Y.State 617.
breeding, results of sixty years of
work in Russia, 773.
car-lot shipments and unloads, U.S.D.A.
860.
car-lot shipments, market distribution,
U.S.D.A. 411.
cause of darkening on exposure to air,
Calif. 719.
citrus, see Citrus.
commercial drying methods, 868.
cooking by passage of an electric cur-
rent through, Iowa 894.
culture experiments, W.Va. 617.
culture in Finland, development, 773.
deterioration, prevention during freez-
ing storage and subsequent thawing,
Calif. 719.
development, relation to embryo and
seed, N.Y.State 617.
dried, insects affecting, 360, 653; U.S.
D.A. 653.
dried, Lepidoptera attacking, field
trapping, 365.
ethylene treatment, health problems,
869.
fertilizer experiments, W.Va. 617.
fresh, grading and marketing stand-
ards, U.S.D.A. 121.
frozen, for ice cream, storage tem-
peratures, 525.
growing in New York, relation to soils,
[N.Y.]Cornell 15.
growing in New York, relation to soils,
correction, [N.Y.]Cornell 744.
in Hudson River Valley, N.Y.State 617.
introduced, tests, Hawaii 327.
new, origin and value, 54.
pectic substances, changes during
storage, 414.
pollination, 478.
pollination by bees, 666.
pollination by hand, [N.Y.]Cornell
773.
precooling and storing, Calif. 616.
production, development and probable
future, 708.
received in trucks at Columbus, Ohio,
wholesale markets, 411.
small, chlorosis-resistant varieties, de-
velopment, Utah 347.
small, varieties, Fla. 327.
small, varieties, new in Russia, 773.

Fruits—Continued.

small, variety tests, N.J. 47; Ohio 47;
Utah 327.
spray residue on, 654.
spray residue removal from, Idaho 46.
stone, brown rot control, [N.Y.]Cornell
788.
storage for farm home, 117.
stored, effect of different washes on,
337.
thinning, Calif. 616.
tropical, storage and preservation,
P.R. 150.
tropical, variety tests, P.R. 182.
variety tests, Ga.Coastal Plain 768;
N.Y.State 617; W.Va. 617.
winter injury, 1933-34 survey, [N.Y.]
Cornell 773; N.Y.State 333.

Fuel from sewage and cellulosic waste, 706.

Fuel, storage for farm home, 117.

Fuels, low grade, utilization, 852.

Fundella cistipennis, notes, P.R. 216.

Fungi—

affecting forest species in North
Caucasus, 803.
and insects in felled Norway pine
logs, interrelations, 211.
arsenic and selenium, U.S.D.A. 448.
imperfect, interspecific anastomosis
and origin of new types, 633.
Imperfecti order Sphaeropsidales, keys,
29.
in Iowa soils, Iowa 743.
of soil, chloropicrin fumigation for,
633.
of Venezuela, explorations and de-
scriptive data, 460.
parasitic, collected on Mt. Hayachine,
Japan, 195.
pythiaceus, growth medium, 636.
soil, interaction, 632.
spores, resistance to low temperatures,
29.
timber rotting, of Arkansas, Ark. 787.
wood-destroying, physiology, 211.

Fungicides—see also Sprays and specific
kinds.

analyses, N.J. 617.
copper, see Copper.
qualities, N.Y.State 617.

Fur-bearing animals—

color inheritance, U.S.D.A. 500.
means of increasing, U.S.D.A. 72.

Furnaces, warm air, studies, 426.

Furs—

effect of dry-cleaning and mechanical
cleaning, 285.
fumigable storage for, U.S.D.A. 653.
importance as natural resource,
U.S.D.A. 500.

Fusarium—

annuum, notes, N.Mex. 207.
conglutinans, notes, Iowa 787; U.S.D.A.
195.
disease of *Cereus schottii*, 356.

Fusarium—Continued.

- moniliforme*, damage to corn kernels, U.S.D.A. 633.
- niveum*, notes, Iowa 787; W.Va. 635.
- niveum*, relation to formation of tyloses in melon plants, 632.
- orthocercus pisi*, notes, U.S.D.A. 640.
- oxysporum aurantiacum*, notes, 498.
- oxysporum* variety, description, 356.
- redolens*, notes, 498.
- rubi*, notes, La. 69.
- spp. causing sweetpotato stem rot, 207.
- spp., color production, role of carbon-nitrogen ratio and acidity, 633.
- spp. in Costa Rica and Panama soils, 489.
- spp., notes, Fla. 346; U.S.D.A. 488.
- spp. on peas, 64.
- strains, relation to China aster wilt, 631.
- vasinfectum butulatum*, notes, 498.
- vasinfectum*, studies, 346; Ark. 786.
- wilt of tomato, N.J. 60; Utah 347.
- yellows of beans, seed transmission, 632.

Fusicladium dendriticum, see Apple scab.

Galacturonic acid, preparation from plant materials, 152.

d-Galacturonic acid, preparation in large quantity, 438.

Galerucella—

- viburni*, biology, 217.
 - xanthomelaena*, see Elm leaf beetle.
- Gall midge population, fluctuations in, 814.
- Galls, bacterial, on geranium, action of various elements on, 802.

Game—

- conditions in Maryland, report, 213.
- laws, 1934-35, U.S.D.A. 356.
- of Oregon, diseases, Oreg. 73.
- protection, directory of officials for, U.S.D.A. 650.

Gardens—

- home, handbook, 326.
- home vegetable, planting and care, Colo. 476.
- management, Ind. 47.

Gargaphia iridescens, notes, 224.

Garlic, breeding, Calif. 616.

Gas engines, see Engines, internal-combustion.

Gases—

- as fungicides, 633.
- in tree stems, composition, Minn. 458.
- physical constants, U.S.D.A. 448.

Gasoline—

- and alcohol blends for internal-combustion engines, Idaho 110, 114.
- taxes, 1933, U.S.D.A. 112.

Gastrectomy, relation to anemia, 892.

Gastritis, parasitic, of sheep, 694, 837.

Gastroenteritis of sheep and parasites causing it, 387, 534.

Gelatin—

- compounds, immunological properties, 436.

Gelatin—Continued.

- films containing derris and pyrethrum, 358.
- in ice cream specialties, 381.
- tryptic digestion, 582.

Gelechia gossypiella, see Bollworm, pink.

Gene manifestation, embryological analysis in abnormal mouse tribe, 602.

Genetics—

- and embryology, treatise, 31.
- animal, U.S.D.A. 463.

Geocoris decoratus, predator of potato psyllid, 812.

Georgia—

- Coastal Plain Station, report, 894.
- Station, notes, 736.

Geranium cutting rot, notes, [N.Y.]Cornell 788.

Gestation in rabbits, effect of anterior lobe extract or human pregnancy urine, 313.

Gibberella—

- disease of wheat, symptoms, 789.
- fujikuroi*, notes, 200.

saubinetii, notes, 201; U.S.D.A. 488.

Gigaleurodes elbaensis n.sp., description, 812.

Girls recovering from malnutrition, dietary and growth rates, 720.

Gizzard worm, recent records, 214.

Gladioli—

- forcing, 783.
- forcing, effect of exposure to high temperatures before planting, 343.
- forcing outdoors by heating soil with electricity, Calif. 545.

Gladiolus—

- corm treatment with mercury ammonium silicate, 648.
- corms, storage, Iowa 768.
- diseases, Fla. 346.
- scab, control, 648; N.J. 60.
- thrips and other pests of gladiolus, Iowa 806.
- thrips, combination sprays with molasses for, 223.
- thrips, notes, 506; Fla. 358: N.Y.State 654.
- thrips on stored corms, control, N.J. 506.
- thrips, studies, [N.Y.]Cornell 807; Ohio 221.

Glaucoma, relation to mineral deficiencies, 726.

Gliadin enzymic digest, glutamine from, 5.

Gloeosporium—

- coryli*, notes, U.S.D.A. 488.
- piperatum*, notes, Ga. 801.

Glomerella cingulata, notes, 802.

Gluronic acid, polarimetric determination, 444.

Glucose—

- dissimilation by *Propionibacterium arabinosum*, 440.
- in peptone and digest culture media, determination, 11.
- ingestion, blood changes following, 372.

- Glucosides of citrus fruits, 781; Fla. 413.
 Glutamine, isolation from enzymic digest of gliadin, 5.
 Glutathione—
 and vitamin C in crystalline lens, 283.
 in potato tubers, 593.
 Glutelins, cereal, preparation and study, Nebr. 739.
 Glycerophosphoric acid, studies, 439.
 Glycogen in livers of pigeons and rats on vitamin B₁-free diets, 420.
 Glyoxalase, mechanism of iodoacetate poisoning of, 153.
Glypta rufescutellaris, notes, Md. 508.
Gnorimoschema operculella, see Potato tuber worm.
 Goats, feeding, breeding, and management, U.S.D.A. 514.
 Goiter in farm animals, prevention, Mont. 825.
 Golf green turf, management, R.I. 317.
 Gonacrine in treatment of ovine babesiosis and nuttalliasis, 694.
Gongylonema pulchrum, egg-laying maturity, development, 214.
Goniops chrysocoma, biological notes, 510.
 Gooseberries—
 crosses, size variation in, 777.
 varieties, Nebr. 769.
 Gooseberry bud blight caused by nematodes, 632.
 Gordura grass, repellent and killing effects on cattle tick, 821.
 Gossypol, cause of discoloration in egg yolks, 239.
 Governmental costs and taxes in rural New York towns, [N.Y.]Cornell 411.
 Governments, local, in Maryland, financial aspects, 863.
 Grain—see also Cereals and Oats, Rye, Wheat, etc.
 as supplement to dairy pastures, 376.
 beetle, saw-toothed, in stored rice, control, 75.
 beetles in stored rice, control, 75.
 binders, adjustment and repair, 851.
 borer, lesser, in stored rice, control, 75.
 distribution, 1930 census data, 716.
 exports of Russia and their future, 861.
 feed, heavy, death losses on, Colo. 837.
 field weeds, control, Calif. 606.
 fumigants, U.S.D.A. 502.
 Futures Administration, report, U.S.D.A. 556.
 grinding for pigs, Pa. 823.
 potassium needs, S.C. 759.
 sclerotium diseases, 630.
 small, nursery technic, 315.
 smuts—see also Smuts and specific grains.
 control, Mo. 488.
 storage and drying, 36.
 stored, respiration, relation to moisture, Iowa 757.
 theoretical value in dairy ration, 523.
 v. no grain for dairy cows, Wyo. 96.
 Grain—Continued.
 varieties for different regions in Maryland, Md. 36.
 Grains for fattening pigs, comparison, Wyo. 671.
 Gram—
 blight in India, 200.
 inheritance of petal color in, 168.
 Gramineae, treatise, 467.
 Granadillas, storage, 52.
 Granuloma, nasal, in cattle, 214.
 Grape—
 black rot, control, 346.
 downy mildew, control, 802.
 downy mildew on California wild grapes, U.S.D.A. 59.
 farms in eastern United States, economic study, [N.Y.]Cornell 54.
 ice, manufacture, 101.
 juice, sterilization, Iowa 894.
 juice, studies, N.Y.State 581.
 juice without fermentation or oxidation, vitamin C in, 567.
 leaf folder, notes, 73.
 leaf hopper, notes, 360.
 mildew, epidemiology, plotting weather factors in, 456.
 mildew parasite, 646.
 mosaic on American stocks in Czechoslovakia, 499.
 mosaic on European and American varieties, 499.
 pollen, viability, 779.
 pomace, ether extract, U.S.D.A. 436.
 variety, aerial roots, anatomy, 625.
 Grapefruit—
 and grapefruit juice, canning, 740.
 cold storage, Fla. 327.
 juice and pulp, preparation, U.S.D.A. 436.
 keeping quality, factors affecting, Fla. 327.
 Marsh, fruit size, relation to foliage, 342.
 pectic constituents, Fla. 5.
 picking, U.S.D.A. 616.
 red-fleshed, origin, 781.
 soil and cultural requirements, Calif. 46.
 storage, 52.
 vitamin C in, effect of spraying, U.S.D.A. 564.
 yield, texture, and time of maturity, factors affecting, 483.
 Grapes—see also Vineyard.
 Chaouch and Dattier de Beyrouth, maturity standards, 779.
 Chasselas Gros Coulard, shedding of flowers, embryological prerequisites, 754.
 composition, Ohio 47.
 Concord, causes of uneven ripening, Ark. 768.
 Concord, inflorescence, primordial development, 341.
 culture experiments, Nebr. 769.
 effect of manure, Ohio 47.

Grapes—Continued.

- Emperor, respiration, effect of sulfur dioxide fumigation, 626.
 - fertilization, Mo. 476.
 - iodized wraps for prevention of rotting, 773.
 - muscadine, culture, varieties, and properties of juices, Ga. 779.
 - parthenocarp and apomixis in, 754.
 - production in Chautauqua region, N.Y. State 617.
 - pruning, Idaho 46; Iowa 769.
 - spraying requirements in Florida, Fla. 347.
 - training, Ohio 47.
 - varieties, Fla. 327; S.C. 769.
 - varieties with defective flowers, 778.
 - variety tests, Calif. 616; Ga.Coastal Plain 768; P.R. 182.
 - winter injury of 1933-34, N.Y.State 333.
- Grapevines, frosted, treatment, 625.
- Graphium ulmi*, see *Ceratostomella ulmi*.
- Grapholitha molesta*, see Fruit moth, oriental.
- Grass—
- disease, cause, 60.
 - grown with alfalfa, nitrogen uptake, 468.
 - sickness in horses, 250.
 - thrips on tobacco plants, 222.
 - weeds of Nebraska, Nebr. 45.
- Grasses—see also Grassland, Lawngrass.
- Meadows, Pastures, etc.
- clipping, effects, 609.
 - culture in Imperial Valley, Calif. 34.
 - for hay and pasture tests, Iowa 757.
 - forage, for hay and pasture, Utah 316.
 - forage, variety tests, Fla. 316; Hawaii 316; Wyo. 606.
 - herbage, interspecific and intergeneric hybrids, 168.
 - meadow, cytological studies, 168.
 - on Jornada Experimental Range, stem structure, 608.
 - pasture, adaptation and propagation, S.C. 759.
 - pasture and forage, variety tests, Fla. 316.
 - pasture, carrying capacity and forage value, Fla. 371.
 - pasture, composition and growth, Fla. 467.
 - pasture, composition and response to fertilizers, Hawaii 316.
 - pasture, composition and vitamins in, Idaho 35, 95.
 - pasture, studies, 467; Fla. 316.
 - pasture, variety tests, Ga.Coastal Plain 757; S.C. 759.
 - putting green, and their management, R.I. 317.
 - response to treatment on acidic upland soils, 607.
 - sclerotium diseases, 630.
 - turf and soil conditions for root development, N.J. 35.

Grasses—Continued.

- variety tests, Idaho 35.
 - yield and composition, effects of fertilizers and frequency of cutting, Fla. 316.
- Grasshopper, migratory, important parasites of, 658.
- Grasshoppers—
- campaign against, Mont. 807.
 - control, 358, 658.
 - control, value, Mich. 506.
 - control with nonarsenical stomach poisons, 221.
 - injurious, studies, Iowa 806.
 - notes, U.S.D.A. 653.
 - Siberian, fertility and climatic adaptations in, 361.
- Grassland—see also Grasses, Meadows, and Pastures.
- and forage crops in Thuringia, Czechoslovakia, and Hungary, 174.
 - fertilizer experiments, 35.
 - management and output on a Lancashire farm, 855.
- Grazing—see also Range.
- systems, comparison, Mo. 466.
 - value for fattening cattle in beef production, Fla. 371.
- Green manure crops, culture in Imperial Valley, Calif. 34.
- Green manures, effect on composition of soil, Fla. 298.
- Green manuring experiments, 36.
- Greenhouse pests, control, Mo. 808.
- Greenhouses—
- carbon dioxide determination in, 327.
 - heating, U.S.D.A. 699.
- Grouse, young, cause of mortality in, 538.
- Growth hormone paste tests, 458.
- Gryllus assimilis*, see Cricket, field.
- Gryllus domesticus*, see Cricket, house.
- Guava, vitamin C in, Hawaii 413.
- Guerinia serratulae* parasite, biology, 816.
- Guinea pigs—
- inbreeding and crossing, U.S.D.A. 463.
 - nutritional requirements, Mo. 522.
- Gullies, stopping, U.S.D.A. 847.
- Gymnosoma fuliginosa*, notes, 224.
- Gymnosporangium*—
- germinate on apples, 354.
 - juniperi-virginianae*, notes, Iowa 787.
- Gypsophila, nodular type gall affecting, 59.
- Gypsy moth—
- development, effect of temperature and humidity, 217.
 - parasites, U.S.D.A. 228.
 - quarantine work with, U.S.D.A. 653.
 - studies, 813.
- Hackberry, performance, Nebr. 769.
- Haematobia irritans*, see Horn fly.
- Haematobia stimulans*, notes, 664.
- Haematopinus adventicius chinensis*, notes, 214.
- Haematopota pluvialis*, transmission experiments of anaplasmosis by, 837.

- Hairy root bacteria, metabolic products, Wis. 489.
- Haldwania liliputana*, biology, 658.
- Halibut liver oil—
 vitamin A potency, relation to diet and intensity of feeding, 565.
 vitamin A potency, seasonal fluctuations, 564.
- Halibut liver oils, grouping, 8.
- Halogenacetic acids, reaction with glutathione and cysteine, 153.
- Halotydeus destructor*, notes, 218, 670.
- Haltichella longicornis*, notes, 80.
- Ham, canned chopped, swelling in, 869.
- Hams, cured, aging, U.S.D.A. 514.
- Hams, curing, Pa. 823.
- Hannah Dairy Research Institute. report, 680.
- Hapalia machaeralis*, biological control, 813.
- Haplothrips aculeatus*, development, 217.
- Haptor, new term for adhesive organs of trematodes, 214.
- Hardpan and bleached sand as products of opposite kinds of climate, 297.
- Hares, snowshoe, color changes in, 213.
- Harmolita tritici*, see Wheat jointworm.
- Harris, A. W., 1858-1935, editorial, 433.
- Harvesting costs on south midland mechanized farm, 855.
- Hawaii Station, report, 429.
- Hawk, marsh, food habits, Iowa 804.
- Hay—see also specific kinds.
 crops, potassium needs, S.C. 759.
 crops, rotation, feeding value, 832.
 crops, supplementary, for Maryland, Md. 37.
 crops, variety tests, N.J. 35.
 dehydrated, for dairy heifers, Pa. 831.
 dryer, mechanical. operation, Vt. 110.
 fermentation, U.S.D.A. 436.
 from pure grasses and mixtures, feeding value, 516.
 meadow, yields and composition, effect of fertilizers, 516.
 mixtures for different regions in Maryland, Md. 36.
 native, v. alfalfa for milk production, Wyo. 680.
 permanent grass, for sandy soils, Md. 36.
 prices and index numbers, Mich. 124.
 production, labor requirements for an acre, Ark. 861.
 proteins, digestibility, U.S.D.A. 516.
 vitamin D in, 887.
- Hazel, wild, leaf spot in Oregon, U.S.D.A. 488.
- Hazelnuts, pollination, 782.
- Health—
 and food, treatise, 559.
 public, relation to veterinary science, 249.
- Heartwater in sheep, 529.
- Heat—see also Temperature.
 dust storms, and drought, record-breaking of 1934, 741.
 economy and comfort in the home.
 effect of heating methods and building construction, 734.
- Heath rust in California, new to United States, U.S.D.A. 59.
- Heathers and mycorrhizas, 597.
- Heating—
 methods and home construction, relation to heat economy and comfort, 734.
 systems, studies, 426.
- Heifers—
 barren, lactation in, 33.
 cost of raising, La. 96.
 dairy, cost of raising, Ky. 95.
 delayed conception and sterility in, Ky. 102.
 grazing experiments on bluegrass pasture, Wis. 466.
 phosphorus in blood, effect of age and phosphorus intake, 523.
 winter feeding methods, N.J. 95.
- Heliothis obsoleta*, see Bollworm and Corn ear worm.
- Helibore and molasses spray, effect on gladiolus thrips, 223.
- Helminth parasites, new records, 214.
- Helminthosporium*—
ocellum, notes, Fla., 347, 354.
papulosum, notes, W.Va. 635.
 phytopathological and taxonomic aspects, 635.
sativum, notes, 491.
sativum, white fertile saltant, production, 630.
sigmoideum irregulare, notes, Ark. 787.
- Helminths in poultry, control, 102.
- Hemadas nubilipennis*, notes, N.J. 75.
- Hematology, handbook, 249.
- Hemlock—
 bark, waste, utilization, U.S.D.A. 436.
 growth in New Hampshire, relation to rainfall, 785.
 spanworm, bionomics and control, 227.
 spanworm in Quebec and Nova Scotia, 813.
- Hemoglobin—
 determination of porcine blood, methods, 388.
 for pigs, postuterine curves, Iowa 822.
 formation, promoted by iron and copper, mechanism, Wis. 559.
- Hemp—
 culture in Imperial Valley, Calif. 34.
 cytology, 749.
 development and yield, effect of irrigation, 177.
 manila, see Abaca.
 seed, drying experiments, 177.
- Hen batteries, Pa. 823.

Hens—

- age, relation to fecundity and hatchability, 240.
- for egg production, selection, U.S.D.A. 91.
- laying—*see also* Egg production.
 - artificial light for, Hawaii 371.
 - individual studies, Ohio 241.
 - range v. confinement, Ohio 521.
 - ovulation in, 829.

Herbivora, synthetic diets for, [N.Y.] Cornell 822.

Heredity—

- in cotton, 309.
- in pigeonpeas, 599.
- in pork production, 601.
- in tobacco, 752.
- of awn development in sorghum, 462.
- of barley crosses, 792.
- of blood groups in fowls, 603.
- of chlamydospore characteristics in oat smut fungi, 630.
- of color, *see* Color inheritance.
- of dwarfism in fowls, 171.
- of foot length, 170.
- of *Fusarium* wilt resistance in flax, 639.
- of high butterfat percentage in Holstein-Friesian, N.J. 98.
- of linkage in barley, 309.
- of localization of tobacco mosaic virus, 642.
- of lodging of straw in rice, 765.
- of oat smuts in hybrids, 62.
- of petal color in gram, 168.
- of resistance to bacterial infection, 381.
- of resistance to bunt and leaf rust in wheat cross, 492.
- of resistance to powdery mildew in wheat, 793.
- of sexual maturity, rate, and persistence of laying in fowls, 678.
- of tuber color in potatoes, 168.
- of white-striped characters in rice, 169.

Hermetia illucens larvae, human parasitism, 815.

Herring meal, composition, nutritive value, and use, 821.

Hessian fly—

- bibliography, U.S.D.A. 366.
- relation to variety-date-of-seeding test of wheat, Mo. 466.
- resistant varieties of wheat, Mo. 501.
- situation in Ohio, Ohio 218.

Hestiasula brunneriana, biology, 658.

Heterodera marioni, *see* Nematodes and Root knot nematode.

Heterodera radiciola, *see* Nematodes and Root knot nematode.

Heteromita globosa, notes, 453.

Heteronychus arator in Australia, 656.

Heterosporium of oats, symptoms, 789.

Heterothallism in *Puccinia* spp., 629.

Hexamermis microamphidis, notes, 670.

Hexuronic acid, *see* Ascorbic acid.

Hicoria glabra and *Juglans mandschurica* embryogeny, comparison, 342.

Hide beetle, protection of hides and skins from, 817.

Hides and skins—

- notes, U.S.D.A. 436.
- protection from skin beetle, 817.

Hierodula westwoodi, biology, 658.

Highway design, costs of construction and physical researches related to, U.S.D.A. 542.

Highways, *see* Roads.

Histidine, colorimetric determination, 10.

Hog cholera—

- studies, U.S.D.A. 528.
- tissue vaccine for, Calif. 689.

Hogs, *see* Pigs and Swine.

Hollyhock *Scierotinia* stem canker, 632.

Home economics leaders, directory, 275.

Home, history of, 428.

Homes, modernizing, 735.

Homesteads, subsistence, *see* Subsistence.

Homona coffearia, notes, 808.

Honey—

- clarifying, U.S.D.A. 436.
 - flora, change due to drought, Wis. 502.
 - gathering, ripening, and storing by bees, Iowa, 806.
 - granulation, [N.Y.] Cornell 807.
 - in storage, fermentation, prevention, Wis. 502.
 - production, effect of meteorological factors, Iowa, 806.
 - production, relation to colony populations, Wyo. 655.
 - uniform quality, production, P.R. 150.
- Honeylocust, performance, Nebr. 769.
- Hookworm, human, development in guinea pigs, 214.

Hop downy mildew—

- control, U.S.D.A. 633.
- in California, 633.
- in England, 63.

Hoplocampa testudinea, control, 233.

Hops—

- culture experiments, 329.
- deterioration after storage, 497.
- prices, cost of production as basis, 266.

Horn fly, transmission experiments with equine encephalomyelitis virus, 390.

Horse sickness, transmission, 529.

Horseflies—

- development and control, 664.
- life history, Ark. 806.
- transmission experiments with equine encephalomyelitis virus, 390.

Horseradish—

- black root disease, control, 639.
- New York market prices, N.J. 124.
- root treatment, N.J. 60.

Horses—

- cottonseed meal for, Tex. 236.
- efficiency of energy transformations in, Mo. 539.
- energy cost of horizontal walking, Mo. 85.

Horses—Continued.

farm, 1930 census data, 552.
breeding, breeding, and management, Ill. 91; U.S.D.A. 514.
for cheap flexible farm power, U.S.D.A. 113.

hyperimmunized against swine erysipelas, hematology, 107.

internal parasites, controlling spread of, 696.

management, treatise, 373.

parasites of, U.S.D.A. 528.

prices and index numbers, Mich. 124.

thiocresol for treatment of summer sores in, Calif. 689.

treatment of wounds with maggots of *Lucilia sericata*, 697.

with an acute encephalitic disease, bacterial flora of brains, 841.

work, efficiency of different ages and body weights, Mo. 86.

Horticultural accounts, 270.

Hotbeds—

heating methods, 770; Mo. 539; Pa. 769; Utah 327.

heating with electricity, N.J. 47; [N.Y.]Cornell 782.

Houseflies—

development and control, 664.

nutrition and metabolism, Iowa 806.

Household—

equipment studies, Iowa 894.

pests, control with poison bran bait, Mich. 502.

Humaria leucoloma, growth protoplasmic streaming and vegetative fusions in, 749.

Humidity—

absolute, course in cambium zone of fallen trap trunks, 217.

effect on metabolism of tomatoes, N.J. 47.

effect on metabolism of tomatoes and apples, 48.

Humus investigations, Iowa 743.

Hurricanes in America, history and attendant phenomena, U.S.D.A. 13.

Hyalopterus arundinis, see Plum aphid, mealy.

Hyblaea puera, biological control, 813.

Hybrid—

vigor in reciprocal crosses of squash, 601.

vigor in wheat, 767.

Hybridization—see also Animal breeding, Plant breeding, and specific animals and plants.

in *Fragaria*, novel type, 169.

Hydrangeas—

color, effect of soil reaction, [N.Y.] Cornell 782.

forcing and propagation, [N.Y.]Cornell 782.

Hydraulic machinery, rotary, fluid mechanics of, 264.

Hydrocarbons—

knocking characteristics, 703.

Hydrocarbons—Continued.

thermal decomposition, effect on engine detonation, 703.

Hydrocephalus, hereditary in mice, anatomical basis, 463.

Hydrocyanic acid gas—

fumigation, N.J. 74.

v. Carboxide gas fumigation, 360.

Hydrophobia, see Rabies.

Hydroxides, ionic exchange with, 162.

Hylemyia—

brassicae, see Cabbage maggot.

cilicrura, see Seed-corn maggot.

Hylocichla sp., host of *Plagiorhynchus formosus*, 214.

Hylurgopinus rufipes, notes, 803.

Hymenolepis—

carioca, notes, 258.

variabilis, cysticeroids of, 214.

Hypera postica, see Alfalfa weevil.

Hyperthyroidism and nutrition, Ark. 885

Hypochnus sasakii on rice and soybeans, 203.

Hypoderma spp., see Cattle grubs.

Hypophyseal substance and prolactin combined, gonadotropic effects, 605.

Hypophysis—see also Pituitary.

vitamin C in, 421.

Hystriognathus genus, studies, 214.

Ice Cream—

bacterial count, effect of aging temperature, 525

bacteriology, 243.

bacteriology and chemistry, U.S.D.A. 525.

crystalline structure, Mo. 525.

effect of density on cost of ingredients, 836.

freezer, Vogt Instant, 242.

fruit flavor for, N.Y.State 682.

manufacture, latest developments, 241, 242.

manufacture, treatise, 381.

microphotographic study, Mo. 525.

milk fat content, Me. 414.

mix, standardizing, new method, 241.

mix, whipping ability, effect of butter, N.J. 95.

mixes, bacterial count, effect of aging treatment, Mass. 527.

physical and crystalline structure, effect of composition and freezing, Mo. 248.

processing, effect of triglycerides and fatty acids, N.J. 95.

qualities, relation to age and temperature, 101.

revision of State laws relating to, Conn.[New Haven] 130.

serving temperature, Mo. 525.

stored in small packages, shrinkage and changes in quality, Vt. 95.

studies, Iowa 830.

texture, improving, Calif. 680.

viscosity measurement, sagging beam method, 687.

Icerya purchasi, see Cottony-cushion scale.
Ichneumonidae, new, from India and China, 820.

Idaho—

Station, notes, 430.
Station, publications available, 142.
Station, report, 141.
University, notes, 430.

Idiocerus spp., biology and control, 225.

Immunization—see also *specific diseases*.

acquired, and resistance in plants, 789.

Income-tax returns for 1932, S.C. 855.

Incubation, artificial, problems [N.Y.]Cornell 823.

Incubators, construction, modification, 347.

Index number—

monthly, of farm prices, Calif. 410.
of production, prices, and income, Ohio 272, 547, 861.

Indian meal moth, notes, 365.

Indiana Station, Moses Fell Annex Farm, report, 141.

Infants—see also *Children*.

feeding, practices in, [N.Y.]Cornell 562.

premature, fed on frozen mother's milk, 872.

vitamin C synthesis by, 283.

whey proteins for, removal of salts from, 523.

Inflation and the farmer, 711.

Inheritance, see *Heredity*.

Insect—

abundance, effect of climate and weather, 218.

and pest legislation in Canada, changes in, 654.

parasites, reared, and hosts, 360.

populations, fluctuations in, 814.

survey in North Carolina, 75.

traps, patents relating to, U.S.D.A. 502.

Insecticide residue studies, S.C. 807.

Insecticides—see also *Sprays and specific forms*.

analyses, N.J. 617.

and insect toxicology, Iowa 806.

and insects, 357.

contact, studies, N.H. 504.

contact, testing on Japanese beetle, 80.

qualities, N.Y.State 617.

studies, N.J. 74.

Insects—see also *Entomology*.

and insecticides, 357.

appendicular or locomotor activity apparatus for recording, 215.

chewing, toxicity of cadmium, 656.

collected in Mexico, 216.

control, U.S.D.A. 699.

development, effect of temperature and humidity, [N.Y.]Cornell 807.

economic, control in Indiana, 216.

economic, in Canada, 807.

economic, in Ceylon, 655.

economic, in Mauritius, 655.

Insects—Continued.

effect of light and radio waves on, N.J. 74.

epidemiology, quantitative relations in, 217.

forest, see *Forest insects*.

household, moth-proofing solutions for, U.S.D.A. 653.

in Cyprus, 655.

in stored grains, peas, and beans, Ala. 358.

injurious—

biological control, 807.

in British Guiana, 808.

in Peru, 818.

in Uganda, 655.

report, 216.

to crops, see *special crops*.

introduction, increase, and control in Western Australia, 656.

of Guiana of medical and veterinary interest, 502.

of Indiana, 806.

orchard, see *Orchard insects*.

penetration of gaseous organic bases into bodies, 656.

scale, see *Scale insects*.

site of loss of water from, 500.

sucking, induced immunity in plants to, 656.

sucking, stylets, renewal and replacement, 806.

sudden outbreaks, 501.

transmission of bean mosaic virus by, 632.

tropical, accommodation to colder zones, 654.

International—

Congress for Scientific Management, agricultural section in, 896.

Institute of Agriculture, notes, 143.

Inulin in chicory, U.S.D.A. 436.

Iodine—

deficiency, calf losses due to, 387.

deficiency problem, special milk for, 871.

in blood, determination, 12, 157.

in corn, milk and limestone, Ky. 8.

in Hawaiian-grown vegetables, Hawaii 413.

in milk, effect of feeding iodized dry milk, 523.

supplements for poultry, Calif. 671.

Iowa—

College, notes, 430, 736.

State Planning Board, progress report, 548.

Station, report, 894.

Ipobracon, notes, Fla. 358.

Ips spp. and fungi associated with, 211.

Iris—

borer, studies, [N.Y.]Cornell 807.

breeding in California, methods and records, 54.

bulbous, *Fusarium* basal rot, 630.

Iris—Continued.

- bulbous, *Tylenchus dipsaci* affecting, 648.
- chromosome number in, 601.

Iritis of breeding hens, negative effect on progeny, Utah 382.

Iron—

- distribution in tissues during peptic digestion and autolysis, 877.
- ferrous, in phosphate rock, 8.
- in blood, determination method, 445.
- in blood plasma and urine in health and in anemia, 877.
- in California prunes, 868.
- in foods used in municipal hospital, 724.
- in milk throughout the season, 523.
- in plants, distribution, 167.
- metabolism in normal and polycythemic subject, 725.
- sulfate, effect on growth and vitality of *Piricularia oryzae*, 198.
- therapy, routine procedure during infancy, 878.

Irradiation—see also Ultraviolet.

- effect on keeping qualities of milk, Wis. 526.

Irrigation—

- and malaria, 217.
- canal in Texas, brick lining for, 262.
- experiments, see *special crops*.
- maintenance of predetermined soil moisture conditions in, 340.
- porous hose method, development in Michigan, 539.
- portable sprinklers for, Calif. 700.
- project, Milk River, agriculture on, Mont. 268.
- pumping, efficiency, Idaho 110.
- research, U.S.D.A. 699.
- water, forecasting supply, Utah 393.
- water, measurement, Colo. 846.
- water, potash in, relation to plant fertilization, Hawaii [Sugar Planters'] 304.
- water, vertical movement in fine sand, P.R. 261.

Isospora—

- lacazii* in English sparrow, 688.
- suvis* n.sp. in swine, 103.

Ivy, English, bacterial canker and leaf spot, N.J. 60.

Ixodes holocyclus in New South Wales, 670.

Ixodes ricinus, see Castor-bean tick.

Japanese beetle—

- certification, distances covered, U.S.D.A. 74.
- control in home garden, U.S.D.A. 81.
- in St. Louis, Mo., U.S.D.A. 653.
- insecticides and soaps for, tests, 80.
- metamorphosis, change in pH of blood, 664.
- notes, U.S.D.A. 652.
- on cranberries and blueberries, N.J. 75.
- quarantine work with, U.S.D.A. 653.

Japanese beetle—Continued.

- stomach-poison insecticides, effectiveness, 81.

traps, method of use, U.S.D.A. 81.

use of naphthalene against, U.S.D.A. 230.

Jerusalem-artichoke—

- breeding, N.J. 35.
- shortening rest period in tubers, 184.

John's disease—

- in France, 102.
- in Great Britain, 255.
- notes, 837.
- of bovines, premunition against, 839.
- of sheep and goats, 534.

Johnson grass—

- diseases in Arizona, key, Ariz. 346.
- feeding, poisonous effect, Mo. 528.

Joints, welded, studied with new type polariscope, 702.

Juglans mandshurica and *Hicoria glabra* embryogeny, comparison, 342.

Jujubes, variety tests, Ga.Coastal Plain 768.

Kale—

- culture experiments, 35.
- fertilizer experiments, 35, 36.
- marrow stem, composition and digestibility, 832.
- New York market prices, N.J. 124.
- tree, for poultry, Hawaii 371.
- tree, marrow-stemmed, for forage, production test, Hawaii 316.

Kamala, effect on egg production and egg weight, 238.

Kansas College, notes, 143, 430, 895.

Kansas Station, notes, 143, 430, 895.

Kefir—

- microflora for preparation with pure cultures, 686.
- peptonizing bacteria in, 687.

Kendir, wild, in Eurasia, 598.

Kentucky Station, notes, 431, 895.

Kentucky Station, report, 142, 894.

Kentucky University, notes, 431.

Keratomalacia in infants, effect of vitamin A, 728.

Kidney—

- of the horse, rare anomaly, 250.
- pulpy, disease of sheep, 519, 694, 837.
- stone formation, relation to nutrition, 570.

worms, control in swine in Southern States, U.S.D.A. 695.

Kitchen equipment and arrangement, relation to time spent and steps taken, Vt. 140.

Klamath weed, control, Calif. 606.

Koa reproduction after fire, 786.

Kohlrabi, New York market prices, N.J. 124.

Kumquats, pectic constituents, Fla. 5.

Labor—

- income in Centre County, Pa. 855.
- return from enterprise, relation to changes in size of enterprise, 854.

Lacon variabilis, larval instars, determining, 232.

Lactation—
 curve, factors affecting, 526.
 in cows, effect of dry period and mineral supplement, 523.
 period, effect on leucocyte count of milk, 525.
 relation to blood leucocytes, 524.
 specific dietary factor for, 284.

Lactobacillus casei, notes, 686.

Lactochrome, one factor of vitamin G complex [N.Y.]Cornell, 823.

Lactose—
 and sugars, formation, 523.
 crystallization, 293.
 properties, 584.
 solutions, color development during heating, 525.

Lamb—
 dysentery in North Wales, 106.
 production, hothouse, Pa. 823.
 quality and palatability, U.S.D.A. 671.
 roasting, Mo. 560.
 shrinkage and heat penetration during roasting, U.S.D.A. 131.

Lambs—see also Sheep.
 crossbred, feeding qualities, Ind. 90.
 crossbred, relative market value, Utah 371.
 effect of shearing on finish, Pa. 823.
 fattening—
 linseed meal for, Pa. 91.
 rations, N.Mex. 90; [N.Y.]Cornell 823; Nebr. 822; Utah 371; Wyo. 671.
 supplemental minerals for, Idaho 88; Colo. 675.
 value of molasses for, Wis. 515.
 value of sugar beet products in, 827.
 feeding costs and returns, Mich. 269.
 feeding experiments, 675.
 feeding experiments, analysis, Colo. 518.
 market, production from aged western ewes, Nebr. 822.
 prices and index numbers, Mich. 124.
 production, cost and profit margin in, Ky. 118.
 pulpy kidney in, relation to faulty feeding of dam, 519.
 stiff, studies, 106; [N.Y.]Cornell 106, 823.
 temporary pasture crops for, [N.Y.]Cornell 823.
 vaccination on range for sore mouth, Colo. 837.
 wintering, roughages for, Wyo. 671.

Land—
 appraisal problem, 862.
 classification as basis for land use planning, 708.
 continuously cropped, dangers of deterioration, 301.
 credit, *see* Agricultural credit.

Land—Continued.
 effect of methods of preparing and of planting, U.S.D.A. 759.
 forest, *see* Forest.
 Idaho, ownership and utilization, Idaho 118.
 in continuous corn and fallow, effect of rates of manuring and irrigation, Utah 317.
 in mountain area of eastern Kentucky, utilization and classification, Ky. 118.
 ownership law, new, in Germany, 854.
 preparation before seeding, Fla. 316.
 prices in East and South shown by government purchases, U.S.D.A. 118.
 reclamation and improvement in Italy, 862.
 recreational uses in Connecticut, [Conn.]Storrs 127.
 resources of Langdale County, Wis. 547.
 settlement, bibliography, U.S.D.A. 403.
 submarginal, policies for, 853.
 tenancy situation in United States, 403.
 use in Grafton County, New Hampshire, 268.
 use in Minnesota, 549.
 use in Montgomery County, [N.Y.]Cornell 709.
 use in northwestern Colorado, Colo. 854.
 use in Tompkins County, New York, methods of study, [N.Y.]Cornell 118.
 use planning, types of research in, 853.
 use policy, cropping system and livestock program for township, Iowa 854.
 use, studies, Ark. 784, 861.

Lands—see also Farm land.
 burned-over, reseeding, Idaho 35.
 cut-over, *see* Cut-over lands.
 dry, loss of nitrogen and organic matter from, Utah 298.
 swamp, *see* Swamp.
 tax delinquent rural, in Arkansas, Ark. 712.

Landscape architecture, classified bibliography, 192.

Lane medical lectures, nutritional problems, 413.

Lard—
 characteristics, relation to culinary value, Iowa 866.
 domestic market for, improving, Iowa 121.
 keeping qualities and uses, U.S.D.A. 514.
 market at home and abroad, Iowa 121.
 prime steam, oxidative deterioration and prevention, Pa. 868.
 rancidity, U.S.D.A. 436.

Laryngotracheitis—
 and gasping disease of chicks, Calif. 689.

Laryngotracheitis—Continued.

infectious, immunization, 259; Mass. 259.

infectious, propagation of virus, 844.

infectious, studies, 258; N.J. 107.

virus, incubator dried, keeping qualities, 390.

Lasioderma serricorne, see Tobacco beetle.

Latania scale, life history and control, Calif. 654.

Latrodectus mactans, notes, 670.

Laundry wastes, treatment, 706.

Lavender and rose perfume production, U.S.D.A. 616.

Lawn cutworm, notes, 656.

Lawngrass, artificial watering, 608.

Lawns, control of crabgrass in, Wis. 466.

Laws and resolutions enacted by 73d Congress of interest to Bureau of Agricultural Economics, U.S.D.A. 711.

Lead arsenate—

for fruits and vegetables, substitutes, Conn.[New Haven] 429.

incompatibility of molasses with, 809. notes, 657.

residues, removal from fruits, solvents for, 331.

substitutes for codling moth control, W.Va. 654.

substitutes, tests, 216.

Lead residues, new method of removing, N.J. 52.

Leaf-footed bug, notes, Fla. 358.

Leaf hopper, blunt-nosed, notes, N.J. 75.

Leaf hopper, six-spotted, notes, Calif. 647.

Leaf hoppers—see also special hosts.

on clover, alfalfa, and grape, control, Ky. 74.

transmission experiments with aster and celery yellows, Calif. 647.

Leather studies, U.S.D.A. 436.

Leaves—

desiccation, automatic registration, 593.

drought- and heat-resistant, anatomical structure, 595.

sulfur on, quantitative determination, 295.

Lecithin—

in milk, relation to abnormal milk, 534.

synthesis in hens on vitamin A- and lipid-free diet, Fla. 413.

Leeks, New York market prices, N.J. 124.

Legume—

bugs, effect on alfalfa seed production, Idaho 74.

bugs, parasites, Idaho 74.

cover crops, winter, production practices, Ga.Coastal Plain 761.

husks, nutritive value, 234.

mosaic viruses, transmissibility to beans, 632.

Legumes—see also Green manure and Alfalfa, Clover, etc.

and corn, interplanting, Ark. 756; S.C. 759.

Legumes—Continued.

and oats mixtures for hay, tests, Calif. 606.

breeding and other research, 606.

cultivation, Wis. 502.

culture in Imperial Valley, Calif. 34.

draft on soil moisture, Nebr. 758.

fertilizer experiments, Fla. 316.

fertilizing effects on certain crops, Ark. 756.

Florida, nodule formation, relation to *Rhizobium* spp., 28.

for corn, date and rate of planting and turning under, Fla. 316.

for cover and green manure, variety tests, Hawaii 316.

for forage and green manure, Md. 36.

for green manure tests, Iowa 757.

for hay and pasture, Utah 316.

forage, nature of injury from potato leaf hopper, 631.

in rotation, effect on yields of corn and wheat, Ky. 35.

inoculation—see also Nodule formation.

commercial cultures, Iowa 743.

effect on crops and on soil conditions in southern Iowa, Iowa 743.

studies, 35.

irregular sporogenesis and polyembryony in, 311.

nodulation and other adaptations, 761.

phosphorus needs and effects on following crops, Fla. 316.

photosynthesis and free nitrogen assimilation, 27.

production, labor requirements for an acre, Ark. 861.

residual effect on bluegrass sods, Ky. 35.

small-seeded, nurse crops for, Iowa 757.

tests, Iowa 757.

variety tests, Fla. 316.

vitamin E in seeds, 457.

winter, studies, Miss. 174.

Leis dimidiata 15-*spilota*, introduction and study, Fla. 353.

Lemon—

brown rot, control, 632.

peel, galacturonic acid from, 152.

trees, cross transfer of water, 192.

Trichoderma rot, type, 633.

Lemons—

on various rootstocks, yield and tree size, 191.

studies, P.R. 182.

transportation, refrigeration and ventilation in, 192.

Leopard moth, studies, N.J. 74.

Lepidoderma albohirtum, control, 359.

Lepidonema genus, studies, 214.

Lepidoptera—

alimentary canal and appendages, comparative morphology, 217.

- Lepidoptera**—Continued.
 caterpillars, inflammation in, 227.
 effect of starvation and close confinement, 216.
 of Argentina, economically important, catalogue, 662.
- Leptidosaphes**—
beckii, see Purple scale.
ulmi, see Oyster-shell scale.
- Leptinotarsa decemlineata**, see Potato beetle, Colorado.
- Leptocoris trivittatus**, see Boxelder bug.
- Leptoglossus phyllopus**, see Leaf-footed bug.
- Leptosphaeria**—
sacchari, notes, Fla. 354.
salvinii, ascigerous stage of *Sclerotium oryzae*, 632.
salvinii, notes, Ark. 787.
salvinii on rice in California, 641.
- Leptospira icterohaemorrhagiae**, notes, 393.
- Lespedeza**—
 comparison of strains, Pa. 764.
 culture experiments, Ga.Coastal Plain 757.
 growth and composition, effect of basic slag and superphosphate, S.C. 759.
 Korean and other varieties, differences in nodule formation, 610.
 Korean, grazing management, U.S.D.A. 605.
 Korean, introduction, U.S.D.A. 605.
 Korean, origin and culture, Tenn. 469.
 Korean, seeds, weight for 1,000, Md. 45.
 native species in Kansas, 177.
 species, cold resistance compared to other legumes, 762.
 variety tests, Ga.Coastal Plain 757; S.C. 759.
- Lespedeza sericea**—
 cutting and grazing tests, S.C. 759.
 experiments, 315.
- Lettuce**—
 bottom rot, [N.Y.]Cornell 208.
 breeding, Pa. 769.
 conducting tissue, nitrate nitrogen and phosphate phosphorus in, Ky. 455.
 culture experiments, Ga.Coastal Plain 768.
 disease, big vein, 640.
 disease-resistant, U.S.D.A. 633.
 drop, control, N.J. 60.
 fertilizer experiments, 329; Ga.Coastal Plain 768.
 growth, effect of temperature and photoperiod, 771.
 head, tipburn resistant strains, development, Colo. 768.
 natural cross-pollination in, 329.
 New York market prices, N.J. 124.
 premature seeding, [N.Y.]Cornell 770.
 seed, moistened, effect of light on germination, U.S.D.A. 616.
 seeds, germination, photochemical reactions in, U.S.D.A. 596.
- Lettuce**—Continued.
 soil and cultural requirements, Calif. 46.
 spotted wilt virus disease, 632; Calif. 634.
 varieties, Fla. 327.
 varieties and breeding, Hawaii 327.
 varieties, effect of light and temperature, 771.
 variety tests, Ga.Coastal Plain 768.
- Leucocytes**—
 chromatic inclusions in, diagnostic value, 697.
 of fowl blood during fowl paralysis, 109.
 removal from milk, effectiveness of clarifier in, U.S.D.A. 525.
- Leucocytozoon** in young grouse, 538.
- Leucorhinia**, host of *Prosthogonimus macrorchis*, Minn. 392.
- Leucosis**, etiology, 843.
- Leucosis** of fowls, Mo. 528.
- Leukemia** in poultry, cause, 260.
- Life span**, extending by dietary means, [N.Y.]Cornell 822.
- Light**—see also Sunlight and Sunshine.
 artificial, effect on winter egg production, Mo. 514.
 artificial, for laying hens, Hawaii 371.
 colored, efficacy in trapping insects, 359.
 rays, activating, energy in terms of vitamin D equivalents, Wis. 560.
 rays, shorter, effect on nitrate utilization of wheat, Wis. 456.
 transmission by egg albumin, 521.
 trap, suction, tests for tobacco beetle, 81.
 trap, use in field and warehouse, Calif. 654.
- Lilies**, breeding, U.S.D.A. 616.
- Lima beans**, see Beans, lima.
- Lime**—see also Calcium and Liming.
 high magnesium and high calcium, comparative value, Ohio 47.
 need and use on Vermont soils, Vt. 24.
- Lime trees**, trunk-girdling disease, Fla. 347.
- Limestone**—
 as substitute for oyster shell in poultry rations, Idaho 88.
 effect on crops and on soil conditions in southern Iowa, Iowa 743.
 fineness of grinding, effect, Mo. 448.
 ground, fineness, Ky. 13.
 in mixed fertilizers for cotton, 315.
 Kentucky, iodine in, Ky. 9.
 response of Illinois soils to, Ill. 24.
- Lime-sulfur**, effect on carbon dioxide intake of apple leaves, 619.
- Liming**—
 and soil acidity, 23.
 experiments, rate of, Ky. 13.
 of Eastern Shore soils, Md. 13.
 western Oregon soils, Ore. 24.

- Linden seeds, dormancy in, [N.Y.] Cornell 457.
- Linkage—
 data on R-g₁ chromosome of corn, 309.
 in barley and inheritance, 309.
 of wide-band and agouti genes, 602.
 mutations in corn, 168.
 mutations of new recessive spotting in mice, 312.
 studies of brachyury in mice, 312.
 tests in poultry, 32.
- Lipids, acid, effect on growth of rats on high fat diet, 282.
- Linseed—
 meal, feeding value, Pa. 91.
 oil utilized in California, 410.
- Lipase in milk, seasonal variations, 524.
- Lipids, acetyl values, method of determination, 444.
- Lipoids and B vitamins, 729.
- Lipolytic enzyme actions, mechanism, 441.
- Liponyssus silvianum*, control, 820.
- Lissorhoptrus simplex*, see Rice water weevil.
- Listroderes obliquus*, see Vegetable weevil.
- Liver—
 beef, alcohol-extracted, nutritive value, 722.
 distribution of iron and copper in, 877.
 esterase, activity, effect of pH, 441.
 fluke, large American, of cattle, 840.
 fluke of sheep, campaign against, 840.
 for treatment of pernicious anemia, 892.
 in man, cholesterol and vitamin A in, 881.
 new dietary principle in, 723.
- Livestock—see also Animals, Mammals, Cattle, Sheep, etc.
 breeding, Iowa 755.
 breeding in Argentina, economic protection, 859.
 cost of production and profits, effect of pastures, U.S.D.A. 87.
 disease from grain and forage, U.S.D.A. 252.
 diseases, see Animal diseases and specific diseases.
 effects of 1934 drought, U.S.D.A. 860.
 emergency feeding, N.Mex. 234.
 feeding, emergency, Mo. 821.
 markets, local, relation to Corn Belt hog marketing, Ill. 858.
 place on southern farms, 370.
 poisoning—see also Plants, poisonous, and specific plants.
 and development of tolerance, 529.
 by passage of nicotine through intact hide, 692.
 with sodium chlorate, lethal dose, 105.
 production and trade, effect of world economic crisis, 861.
 production methods, effect of feeding demonstrations, 370.
 situation, Okla. 707.
- Livestock—Continued.
 statistics, see Agricultural statistics.
 trucking studies, Wis. 548.
- Living, standard of, see Standard.
- Lizard, desert, control of beet leaf hopper by, Utah 359.
- Lizards—
 as factor in control of range insects, 357.
 food habits, Utah 359.
 food habits in Philippines, 805.
- Locust, black—
 planting experiments, Ark. 784.
 seed treatment for increased germination, Iowa 784.
 seedlings, damping-off, U.S.D.A. 195.
- Locusta—
migratoria migratorioides, notes, 811.
migratorioides, notes, 502.
- Locusts—
 control, 810.
 in Cyprus, 655.
 in Nyasaland, 502.
 in Tanganyika, 655.
 migratory, sexual maturation in, 361.
 Moroccan, in Sardinia, 658.
 outbreak in Africa and western Asia, 811.
 red winged, control, 656.
- Loganberries, training, 341.
- Logs, stain, mold, and decay in, prevention, U.S.D.A. 633.
- Louisiana Station, notes, 287, 431.
- Louisiana University, notes, 895.
- Louse, sucking, of pigs, identity and scientific name for, 214.
- Loxostege commixtalis*, see Alfalfa webworm.
- Loxostege sticticalis*, see Webworm, beet.
- Lubricant from ethylene, 703.
- Lucern, see Alfalfa.
- Lucilia—
bufonivora, biology, 229.
cuprina larvae, nutrition, 367.
sericata, effect of environment, 229.
sericata in sheep in Zuider Zee Department, 217.
sericata larvae for treatment of wounds of horses, 696.
sericata larvae, role in osteomyelitis wounds, 815.
- Lumber—see also Timber and Wood.
 distribution and consumption, 1932, U.S.D.A. 57.
 physical properties, 262.
 stain, mold, and decay in, prevention, U.S.D.A. 633.
- Lungworms—
 of foxes, control, 539.
 of sheep, control, W.Va. 695.
- Lycacna theonius* larvae on lima beans and *Crotalaria incana*, 655.
- Lyda arvensis*, severe attack by, 217.
- Lygocerus semiramus*, notes, 225.
- Lygus elisus*, notes, Idaho 74.
- Lygus hesperus*, notes, Idaho 74.
- Lygus pratensis*, see Tarnished plant bug.

- Lymantria monacha*, ecology, 216.
Lymantria monacha, studies, 813.
 Lymphadenitis—
 caseous, spread, 105.
 in sheep, effect of skin wounds made during shearing, 840.
 Lymphoid infiltrations, examination of brachial plexus of fowls for, 391.
 Lymphomatosis of poultry, Idaho 102.
 Macadamia nut, culture and fertilizer experiments, Hawaii 327.
 Macaroni, experimental manufacture, equipment for, 868.
 Machinery, *see* Agricultural machinery.
Macrocentrus anaglyvorus—
 notes, Md. 508; N.Y.State 667; U.S.D.A. 653.
 sex ratio, 501.
Macronoctua onusta, *see* Iris borer.
Macrosiphum—
 mesosphaeri n.sp., description, 812.
 solanifolii, *see* Potato aphid.
Macrosporium sarcinaeforme, notes, 351.
 Maggots, production for surgical use, disinfection of eggs, 689.
 Magnesium—
 carbonate and calcium carbonate, relative amounts in Minnesota subsoils, 747.
 compounds, soil-type responses to, U.S.D.A. 448.
 deficiency due to previous fertilizer treatments, 306.
 deficiency, effect on potato yields, U.S.D.A. 64.
 deficiency in animals, 876.
 in biological fluids, determination, Koltzoff's colorimetric method, 445.
 losses from cultivation of forest land, 194.
 serum, in rats, relation to sex and age, 875.
Malacosoma americana, *see* Tent caterpillar, eastern.
 Malaria—*see also* Mosquitoes and *Anopheles*.
 and Culicidae in Philippines, 814.
 and irrigation, 217.
 prophylaxis, automatic distributing machine for paris green mixtures, 220.
 Mallein studies, U.S.D.A. 528.
 Malnutrition—*see also* Nutrition and Undernutrition.
 use of concentrated diet in, 137.
 Malta fever, *see* Undulant fever.
 Maltose in peptone and digest culture media, determination, 11.
 Mammals—*see also* Animals and *specific kinds*.
 hair color, effect of visual stimuli, 312.
 infection with American human trypanosomiasis, 531.
 of Great Britain, parasites of, 514.
 popular account, 650.
 Mammary gland—
 development and function, [N.Y.] Cornell 756.
 development and role of sex hormones, Mo. 464.
 experimental development, Mo. 172.
 in cats and dogs, development, Mo. 33.
 in dairy cattle, causes of growth and function, Mo. 33.
 Mammary glands, functional individuality of quarters, Mo. 99.
 Mammitis, *see* Mastitis.
 Mandarin rot, symptoms, 789.
 Manganese—
 deficiency, effect on crops, R.I. 27.
 fertilization on Coastal Plain, Md. 14.
 in California prunes, 868.
 sulfate, effect on potato yields, S.C. 759.
 toxicity to Turkish tobacco in acid soils, 748.
 Mangels, fertilizer experiments, 35.
 Mango—
 cecidomyid fly, notes, 656.
 hoppers, control in Bombay, 225.
 leaves, weevil pests of, 666.
 weevil, effect of subfreezing temperatures, 368.
 Mangoes—
 propagation, 483.
 storage studies, 342.
 variety tests, P.R. 182.
 Manila hemp, *see* Abaca.
 Mannose administration, effect on blood sugar, 724.
 Mantes, praying, hardy in New York, 810.
 Mantidae, biology, 658.
 Manure—
 containers, fly-free, description, 664.
 heaps, treating for fly control, 664.
 Mapboards, mounting, 786.
 Maple—
 products, studies, U.S.D.A. 436.
 trees, sap composition, variation in, Pa. 785.
 Marble dust as mineral supplements to dairy ration, 375.
 Mares, pregnant, blood of, concentration of gonadotropic hormone, 604.
Margaronia pyloalis, mermithid worm parasitic in, 670.
 Market—
 Chicago, competitive position in region of grain supply, 856.
 intelligence, collection, and uses, 267.
 reports, U.S.D.A. 126, 271, 556, 859.
 Wilmington curb, data, Del. 555.
 Marketing—*see also* *special products*.
 boards, financing, 266.
 by government boards or organizations, efforts to control, 714.
 extension work in, 853.
 margins in, 853.

Marketing—Continued.

- organized, relation to progress in production, 267.
- physical organization, 853.
- schemes in Great Britain, 856.
- Marmot typhus bacillus, fate of in organism of fleas, 692.
- Martens, breeding experiments, U.S.D.A. 500.
- Maruca testulalis*, notes, P.R. 216.
- Maryland Station, crop and soil management practices, Md. 142.
- Massachusetts College, notes, 431.
- Massachusetts Station, notes, 575.
- Mastitis—
 - acute, in cattle, inherited susceptibility, 601.
 - and low curd tension of milk, Idaho 95.
 - bovine, and types of leucocytes in market milk, 532.
 - chronic, cause, detection, and control, N.Y.State 105.
 - detection, U.S.D.A. 525.
 - detection and control, N.Y.State 693.
 - detection, laboratory and field methods, 105, 250.
 - diagnosis, new method, N.Y.State 386.
 - gangrenous, in cows, natural and experimentally produced, 386.
 - in Great Britain, 255.
 - milk, detection, 242.
 - of cattle, 837; Idaho 102.
 - relation to abortion, 385.
 - studies, U.S.D.A. 528; Wis. 529.
 - transmission studies, 386.
 - types of streptococci in, [Conn.] Storrs 256.
- Materials, A.S.T.M. tentative standards, 701.
- May beetles of Iowa, 230.
- Mayorella palestinesis*, notes, 453.
- Meadows—see also Grasses, Grassland, and Pastures.
 - improvement, Nebr. 758.
- Meal moth, notes, 365.
- Meal worm, yellow, tests of insecticides for, 504.
- Mealybug—
 - citrus, tests of insecticides for, 504.
 - long-tailed, parasite introduced into California, 370.
 - Mexican, reproduction in, 225.
 - pineapple, control, 656.
- Mealybugs—
 - control with refined petroleum distillate, 505.
 - reproduction in, 225.
- Meat—see also Beef, Lamb, Pork, etc.
 - and meat products, inspection, U.S.D.A. 528.
 - animals and wool, index numbers, Mich. 124.
 - animals, importance of feeding, U.S.D.A. 514.
 - care in household refrigerator, Iowa 894.

Meat—Continued.

- chilling and curing in home-made cooling box, U.S.D.A. 87.
- cooked, tenderness and juiciness, 866.
- cooking charts, U.S.D.A. 414.
- dishes at low cost, U.S.D.A. 560.
- grading, 235.
- imports, changes in volume, 855.
- inspection, textbook, 101.
- meal, vitamins, proteins, and fats in, effect, U.S.D.A. 514.
- nutrition, quality and palatability, 89.
- nutritional properties, Mo. 515.
- nutritive value for chicks, N.Mex. 93.
- products, dried, feeding value for poultry, Nebr. 822.
- program, extension, development, 370.
- quality, factors affecting, U.S.D.A. 514.
- roasting and canning, U.S.D.A. 560.
- scrap in chick rations, proportions, Mo. 514.
- scrap v. tankage in chick rations, Wis. 515.
- spiced canned, swelling in, 869.
- thermal properties, 130.
- Mediterranean fever, see Undulant fever.
- Melampsora lini*, heterothallism in, 796.
- Melanogromyza simplex*, appearance in England, 510.
- Melanconium fuligineum* spores, resistance to low temperatures, 29.
- Melanocallis caryaefoliae*, control, 812.
- Melanophora roralis*, biology and larval forms, 229.
- Melon—
 - plants, tyloses in, relation to *Fusarium nivum*, 632.
 - wilt-resistant strains and varieties, morphology and cytology, Iowa 788.
- Melons—
 - disease-resistant, U.S.D.A. 633.
 - in frames, carbon dioxide experiments, 330.
 - insects affecting, Mo. 501.
- Men, old, basal metabolism, 416.
- Men, young, functional efficiency and body build in, 415, 416.
- Mental effort—
 - and metabolism, 279.
 - energy requirements, 279.
- Mercurialis annua*, intersexual flowers, cytology, 597.
- Mercuric chloride—
 - and potassium iodide, fungicidal efficiency, 631.
 - treatment of soil, effect on brussels sprouts seedlings, 770.
- Mercury ammonium silicate for gladiolus treatment, 648.
- Mermithid worm parasitic in *Margarona pyloalis*, 670.
- Meromyza americana*, see Wheat stem maggot.
- Mescinta peruella*, notes, 814.
- Mesochorus*, new genus, description, 820.
- Mesostenus gracilis*, notes, 365.

Metabolism—**basal—**

- and age, Mo. 515.
- and growth of preschool children, 721.
- effect of vitamin A in diet, 418.
- of Mapuchian Indians in Araucania, 720, 870.
- of mature animals and body weight, Mo. 824.
- of old people, 416.

disorders of, 890.

Metagonistylum minense, introduction from Brazil into British Guiana, 510.

Metallic compounds, effect on nutritional anemia, 570.

Metals—

- and alloys, research on, 701.
- effect on milk, 834.

Metaponorthus pruinosis, notes, 229.

Metaxenia in apple and squash, 311.

Meteorological—

- observations, Mass. 160, 448, 742; U.S.D.A. 159, 741, 894; Wyo. 589.
- observations during pine noctuid control work, 216.
- organizations, European, 160.

Meteorology—*see also* Climate, Rainfall, Temperature, Weather, etc.

- agricultural, studies in micro-climatology, 12.

papers on, U.S.D.A. 159, 741.

Methyl thiocyanate fumigation of scale insects, U.S.D.A. 502.

Methyl-d-galacturonide, preparation and kinetics of hydrolysis, 439.

Methylglycosides of naturally occurring hexuronic acids, 439.

Metritona circumdata, life history, 665.

Mice, new recessive spotting, inheritance and linkage relations, 312.

Michigan College, notes, 575.

Michigan Station, notes, 895.

Microamoeba oblonga, notes, 453.

Microbiology, soil, and climate, 588.

Microbiology, treatise, 836.

Microbracon—

- brevicornis*, notes, 365; U.S.D.A. 653.
- cushmani* attacking *Desmia funeralis*, 73.
- hebetor*, notes, 365.
- mellitor*, notes, U.S.D.A. 653.
- pygmaeus*, biology, 667.
- tachypteri*, notes, 513.
- variabilis*, notes, 513.

Microburette, horizontal, description, 446.

Microclimatology, 12, 297.

Microfilariae in blood of cattle, 532.

Micro-organisms—*see also* Bacteria and Organisms.

- and vitamin A production in green plants, 517.
- carotene in, 442.
- cytology, 837.
- growth at and below 0° C., 347.

Micro-organisms—Continued.

in humus and in soil, blue stain for, 164.

in wood-eating insects, role in wood digestion, 500.

interference of base exchange by, Mo. 448.

number falling from air in dairy plants, 683.

soil, competition for plant nutrients, 19.

use in sugar analysis, 157.

variant forms of, symbiosis as factor, 597.

Microphanurus megacephalus, introduction from Egypt into Western Australia, 667.

Microsphaera quercina perfect stage, notes, 489.

Microtetrameres helix, notes, 214.

Microtoridea, new genus, description, 820.

Mildew—*see also* host plants.

powdery, direct use of mineral sulfur for, 198.

Milk—

abnormal flavors in, [N.Y.] Cornell 830.

acid formation in, sudden changes in rate, 833.

acidophilus, bacteriological changes at room and ice-box temperatures, 834.

acidophilus, feeding results, 376.

acidophilus, manufacture and importance, 241.

and cream collection in Maine, economic study, Me. 406.

and milk preparations, nutritive deficiencies, 870.

and milk products, nutritional value, 833.

antirachitic potency, effect of diet of cow, Iowa 830.

bacteria and flavor in, effect of delayed cooling, 241.

bacteria, thermophilic, nature and control, 242.

bacterial content, effect of temperature, Vt. 100.

bacterial count, Van Oijen method, 100.

bacterial counts, increasing accuracy, N.Y. State 682.

bacteriology and chemistry, U.S.D.A. 525.

bottles, scratching, studies, 376.

bottles, washed, alkali drip and broken glass in, 376.

Brucella abortus contamination in a vaccinated herd, 384.

Caucasian fermented, peptonizing bacteria in, 687.

changes in, effect of heat, Mo. 525.

characteristics, effect of homogenization, U.S.D.A. 246.

chocolate, nonsettling preparation, milk-soluble, 836.

coliform organism isolated from, 834.

Milk—Continued.

- coliform organisms and keeping quality, 100.
- color in, effect of various feeds, Pa. 831.
- composite samples, preservation, 242.
- composition, Calif. 680.
- composition and yield, effect of udder injections, 524.
- composition, effect of act of milking, 526.
- constituents, fluorescence in filtered ultraviolet rays, 525.
- consumption in Minneapolis, Minn. 714.
- converting into soft curd milk, new method, 246.
- cooling experiments, 241.
- cooling mediums, 376.
- cooling on farms and effect on quality, Nebr. 846.
- cost of production, Ky. 118.
- curd tension, effect of homogenization, 377; Idaho 95.
- Dealers, International Association. proceedings, 376.
- distribution and consumption in—
 - Allegheny County, Pennsylvania. Pa. 858.
 - Reading, Pennsylvania, Pa. 858.
 - Williamsport, Pennsylvania, Pa. 858.
- distributors' margins and prices to dairymen, Wis. 547.
- disturbance of natural oxidation-reduction equilibrium, 525.
- effect on metals, 834.
- evaporated—
 - bacteriology and chemistry, U.S. D.A. 525.
 - color, 525.
 - heat resisting organisms in, 242.
 - Irradiation, Wis. 526.
 - use in digestive disorders, 722.
- examination in detection and control of mastitis, 105.
- examination, methylene blue reductase test, value, 684.
- fat content, effect of feeding, 682.
- fever, acid-base balance during and after pregnancy, 692.
- first drawn, fat content, [N.Y.]Cornell 830.
- flavor and milk fat, effect of alfalfa hay, 524.
- flavors in, Calif. 680.
- foam producing substances, 525.
- freezing effects, 525.
- goats', vitamins, proteins, and fats in, effect, U.S.D.A. 514.
- grading for butter making, 241.
- homogenization, 377, 524; U.S.D.A. 525.
- homogenized, sedimentation, 524.
- human, composition, 278.

Milk—Continued.

- human, fat in, 872.
- human, preserved by freezing for feeding of premature infants, 872.
- human, studies, 727, 871.
- inspection, city, improvement, 241.
- iodine in, effect of feeding iodized dry milk, 523.
- irradiated—
 - effect of fat and time of exposure on antirachitic potency, 378.
 - reflecting properties and antirachitic activation, 683.
 - transmission and antirachitic action, 245.
- irradiation, activating energy, effect of film characteristics on efficiency of utilization, 378.
- keeping qualities, improving by irradiation, Wis. 526.
- Kentucky, iodine in, Ky. 9.
- Kuban-fermented, characteristics, 527.
- market, bacterial counts in, practical limits, 525.
- market, creaming ability, 242.
- market, flash heating and cooling, 242.
- market, grading, 242.
- market, of Iowa, studies, Iowa 830.
- market of Philadelphia, current problems, Pa. 857.
- market, plant problems, 241.
- market, quality control, 242.
- market, types of leucocytes in, relation to mastitis, 532.
- marketing, Ky. 118.
- marketing agreements and licenses, 523.
- marketing, cooperative, 241.
- marketing schemes and price policies, 857.
- mechanical coolers for, U.S.D.A. 699
- methylene blue reduction test, light and temperature as factors, Vt. 100.
- mineral nutritional properties, 377.
- nutritional qualities, effect of fluorine ingestion, 378.
- of camels, fatty acids and glycerides of, 440.
- oxidized flavors in, source, 524; [N.Y.] Cornell 99.
- palatability, effect of butterfat in and standardization, U.S.D.A. 524.
- pasteurizability determination, 376.
- pasteurization—
 - effect on nutritive properties, 376.
 - effect on vitamin B and G in, 245.
 - effect on vitamin C in, 379.
 - heat transfer through pasteurizer linings, 377.
 - in United States, high-temperature, short-time holding, 376.
 - methods, effect on vitamins in, Pa. 879.
 - nutritional aspects, 278.
- physical properties, effect on rate of digestion in vivo, Iowa 830.

Milk—Continued.

- powders, solubility, 834.
- prices and index numbers, Mich. 124.
- producer-retailers' profits, 855.
- producers, reaction to types of buying plans in use, Ohio 857.

production—

- alfalfa v. native hay for, Wyo. 680.

differences in, cause, 524.

effect of three planes of protein intake, 524.

feeding for, 242.

food costs relation to yield, 855.

indicators of success in, 266.

nutritive value of proteins for, 526.

of cows, relation to conformation of parents, 682.

relation to conformation of cow, 681.

timothy hay v. alfalfa hay for, 523.

with excessive cottonseed meal, 524.

products—

concentrated, boiling point elevation, 246.

condensed, effect of metals on flavor, Wis. 526.

physiologic actions, 242.

properties, effect of heat transfer rates, 524.

quality, factors affecting, Nebr. 830.

quality, production, and distribution problems, 243.

raw and boiled, gastric digestion in infants, 415.

raw, bacteriological examination by agar plate count method, 684.

rennet coagulation, 524.

samples, *Actinomyces* spp. in, 683.

sampling where a combine milker is used, Mo. 525.

secretion—

effect of thyroidectomy and thyroid feeding, 98.

experimental initiation in rats, 173.

hormones concerned with, 523.

physiology, U.S.D.A. 680.

skimmed, see Skim milk.

soft-curd—

commercial, 242.

production and value, 523.

studies, Pa. 831; Utah 414.

value for infant feeding, Calif. 680.

solids-not-fat in, variations, 526.

sour, value for egg production, Mo. 514.

storage rooms, air conditioning, 241.

straining, an involved operation, N.Y.State 429.

straining on the farm, N.Y.State 684.

sugar and its beta derivative, 242.

testing, laboratory methods, 376.

Milk—Continued.

testing, new Minnesota Babcock test reagent, 242.

variations in solids-not-fat content, 833.

vitamin D evaporated, production by irradiation, 523.

vitamin D, irradiated yeast v. irradiated ergosterol for, 245.

vitamins in, recent developments, 242.

water cooling of, Ark. 846.

yield, correction for age and size of cow, 523.

yield, effects of hand and machine milking, 832.

Milker, new magnetic, 241.

Milking—

incomplete, U.S.D.A. 525.

machine v. hand, effect on milk, 832.

machines, rubber parts, effect of heat and chemical sterilization, 377.

pails, low pressure steam sterilizer for, 249.

Millet—

Japanese, vernalization experiments, 607.

seed, Colo. 757.

Millipedes—

injurious, notes, 506.

relation to potato tuber defects, [N.Y.] Cornell 807.

Milo disease, soil-borne, U.S.D.A. 633.

Mineola moth and San Jose scale, combination spray for, Idaho 74.

Mineral—

assimilation from two typical fodders, 826.

deficiency of soils, soil plaque method of determination, Colo. 743.

imbalance in diet, effect on growth and composition of rats, 417.

metabolism, Vt. 95.

metabolism of animals, changes in due to magnesium deprivation, 876.

metabolism of pullets, 678.

nutrition of dairy cattle, 523.

nutrition, unbalanced, effect on carbohydrate elaboration in crops, Fla. 347.

oil, effect on adsorption of carotene and vitamin A from digestive tract, Pa. 879.

requirements for chicks, 371.

requirements of dairy cows, 242.

supplements to beet byproducts for cattle fattening, Colo. 821.

Minerals—

feeding, problem, 370.

feeding to pigs, P. R. 233.

for beef cattle, Wyo. 671.

for dairy cattle, La. 97.

for fattening steers, Colo. 674.

for lamb fattening rations, Colo. 675.

in citrus fruits, 781.

in feeds, Pa. 823.

in grains, Utah 317.

in Pennsylvania soils, Pa. 743.

Minnesota Station, notes, 736.
 Minnows, top-feeding, for mosquito control in Utah, 806.
 Mint leaf spot disease in Japan, 210.
 Missouri Station, report, 574.
 Mite—
 disease of tomato, tobacco, and other plants in Philippines, 820.
 new predacious, on lemon trees infested with California red scale, 233.
 red-legged earth, notes, 218, 670.
 six-spotted, lime-sulfur as control, Fla. 358.
 Mitogenetic radiation, proof by physical method, 457.
 Moisture—
 in flues, condensation, 265.
 meter, Tag-Heppenstall, instructions for installation and operation, U.S.D.A. 326.
 Molasses—
 as dairy feed, Wis. 525.
 blackstrap, for fattening steers and mules, 370.
 fermentation flavors in, U.S.D.A. 436.
 for fattening livestock, Wis. 515.
 for pigs, Wis. 515.
 in grain mixtures, feeding value, 523.
 incompatibility with sodium fluosilicate and lead arsenate, 809.
 sugarcane, as poultry feed, Hawaii 371.
 sugarcane, for dairy cows, Hawaii 376.
 sugarcane, v. barley for pigs, Hawaii 371.
 water, sucrose, and invert sugar in, Me. 414.
 Mold proteins in diets, value, 516.
 Molds, growth, effect of oxidation-reduction potential of medium, 524.
Moniezia expansa, notes, 388.
Monilia tropicalis, use in sugar analysis, 157.
 Monkeys, effect of intravenous administration of pregnancy urine factor, 465.
Monomacrodon, new genus erection, 820.
 Montana Station, report, 894.
 Moorland soils of Lombardy, protozoa of, 29.
 Moose, diseases affecting, Minn. 694.
 Mortars and bricks, properties, relation to bond, 396.
 Mosaic disease, *see specific host plants*.
 Mosquito—
 Extermination Association of New Jersey, report, 228.
 fish in Utah, 806.
 larvae, tests of sulfur compounds against, 503.
 survey in Union of South Africa, 529.
 Mosquitoes—*see also Anopheles and Malaria*.
 biology, 216.
 control, 228; N.J. 74; Utah 359; U.S.D.A. 653.
 control in Calcutta, 662.

Mosquitoes—Continued.
 control in California, 366.
 handling for experimental purposes under South African conditions, 529.
 insecticide spray tests for, 218.
 large-scale control, U.S.D.A. 652.
 salt marsh, control, 689.
 transmission experiments with equine encephalomyelitis virus, 390, 695.
 Moth proteins, serological studies, 662.
 Motion pictures of United States Department of Agriculture, U.S.D.A. 865.
 Motor—
 fuels, use of creosote and other tar oils, 399.
 tillage demonstration, French, 704.
 vehicle registrations, State, and registration fees, U.S.D.A. 262.
 vehicle tractive resistance and air resistance, 850.
 vehicles, taxation in 1932, U.S.D.A. 395.
 Mountain apple, nutritive value, 277.
 Mouse flea survey of Los Angeles Harbor, 816.
 Mouse plague, studies, 103.
 M-ray research, fluorescence in, 593.
 Muck—
 Crops Experiment Farm, research, Ohio 48.
 land potato spraying experiments, [N.Y.]Cornell 807.
 soils, control of ground water in, U.S.D.A. 699.
 Mules—
 cottonseed meal for, Tex. 236.
 fattening with blackstrap molasses, 370.
 for cheap flexible farm power, U.S.D.A. 113.
 pineapple bran as feed for, Hawaii, 373.
 Mung bean hay for milking cows, 376.
 Mung beans for hay and seed, tests, Ark. 756.
Musa, genetical and cytological studies, 755.
Musca domestica, *see* House flies.
 Mushroom—
 compost, synthetic, Pa. 769.
 fumigation, sulfur for, U.S.D.A. 502.
 insects and allied pests, 492.
 insects, occurrence and control, Pa. 807.
 insects, sulfur for, U.S.D.A. 653.
 root rot of citrus trees and other woody plants, Fla. 346.
 truffle, control, Pa. 789.
 Mushrooms, cultivated, effect of carbon dioxide, 631.
 Musk ox studies, U.S.D.A. 500.
 Muskmelon—
 seed, mosaic transmitted by, 351.
 seedlings, effect of temperature and nutrition on growth, 330.
Verticillium wilt, inoculation tests with, 801.

- Muskmelons—
 culture in New York, N.Y. State 477.
 fertilization, Ark. 768.
 marketing, U.S.D.A. 121.
 mildew-resistant, breeding, Calif. 616.
Sclerotium rot of, Ark. 787.
 soil and cultural requirements, Calif. 46.
 storage, 52.
- Muskkrats—
 distribution in British Isles, 804.
 studies, U.S.D.A. 500.
- Mutation—
 in mice, 463.
 single factor, in *Melilotus alba* with multiple effects, 311.
- Mutations induced by irradiation and spontaneous, in corn, comparison, Mo. 466.
- Mutton, shrinkage and heat penetration during roasting, U.S.D.A. 131.
- Mycobacterium paratuberculosis*, notes, 839.
- Mycorrhizas and heathers, 597.
- Mycosphaerella*—
citrullina, notes, Fla. 346.
fragariae, mode of infection, 68.
- Myiasis—
 and *Cochliomyia* in tropical America, 815.
 human intestinal, 815.
 traumatic dermal, new treatment, 383.
- Myriogenospora disease of grasses, 60.
- Myzocallis fumipennellus*, see Pecan aphid, black.
- Myzus cerasi*, see Cherry aphid, black.
- Myzus persicae*, see Peach aphid, green.
- Naganol for surra treatment, tests, 535.
- Nailed joints, strength tests, 262.
- Nanophyetus salmincola*, notes, Oreg. 73.
- Naphthalene, use against Japanese beetle, U.S.D.A. 230.
- Napier grass—
 as pasture and green fodder crop, Hawaii, 469.
 fertilizer experiments, Fla. 316.
- Narcissus—
 bulb or stem nematode, weeds as carriers, U.S.D.A. 59.
 bulbs, storage, Fla. 327.
 diseases, Fla. 346.
 eelworm, quarantine against, U.S.D.A. 634.
 mosaic and leaf scorch, control, [N.Y.] Cornell 788.
- Nasturtiums, breeding, Calif. 616.
- National Agricultural Research Bureau of China, scope and work, 577, 735.
- Naval Stores Station of Bureau of Chemistry and Soils, U.S.D.A. 345.
- Nebraska Station, notes, 575.
- Nebraska Station, report, 894.
- Necator americanus*, development in guinea pigs, 214.
- Nectarine seedlings, resistance to nematodes, Calif. 616.
- Nectria*—
 canker of basswood, 632.
 24476—35—8
- Nectria*—Continued.
 canker on hardwoods, range and importance in Northeast, 802.
coccinea on beech, 630.
coccinea, relation to beech bark disease, 659.
galligena, notes, W.Va. 635, 649.
 Negro life in rural Virginia, Va. 274.
- Nematode—see also Root knot nematode.
 new, from intestine of fowls in Brazil, 697.
 swine, life cycle and behavior of infective larvae, U.S.D.A. 695.
- Nematodes—
 beet and oats, identity of species, 500.
 bursate, of horses and sheep, bionomics and control, 251.
 cause of new skin disease of cattle in United States, 840.
 control in Everglades, Fla. 347.
 control with cyanamide, Fla. 346.
 effect on cotton seedling growth, S.C. 789.
 in Puerto Rico, P.R. 195.
 leaf, new host plants, 803.
 of sheep in Manawatu district, New Zealand, 841.
 on rice, 491.
 plant parasitic, and diseases caused by, treatise, 212.
 stem and bulb, new economic hosts, 633.
- Nematodirus* spp., egg production by, 214.
- Nematospora*—
gossypii growth, accessory factor for, 29.
phaseoli, notes, Va. 223.
 spp. in Florida, Fla. 347.
- Nemeritis canescens*—
 food habits and flight experiments, 232.
 notes, 365.
- Neon light for greenhouse plants, tests, 400.
- Neosminthurus* new genus, erection, 361.
- Neotermes castaneus*—
 morphology, biology, and natural enemies, 810.
 notes, Fla. 358.
- Neotylenchus obesus* n.sp. in lesions on alfalfa crowns, 650.
- Nepticula gossypii*, notes, 75.
- Nettle grubs, control, 808.
- Neuritis in fowls, quick method of diagnosis, 698.
- Nevada Station, notes, 431.
- New Deal, direction, 243.
- New Jersey Stations, notes, 575.
- New Jersey Stations, reports, 142.
- New York Cornell Station, report, 894.
- New York State Station, report, 735.
- Newcastle disease and fowl plague viruses, differentiation, 845.
- Nickel, effect on milk, 834.
- Nicotiana*—
 hybrid, backcrossing, derivative types obtained by, 461.

Nicotiana—Continued.

- species hybrids, crossing over in, 168.
- tabacum*, inheritance of glaucous and yellow characters in, 752.
- tabacum* single X-rayed sex cell, types derived from, 461.

Nicotine—

- and molasses spray, effect on gladiolus thrips, 223.
- in codling moth control, 364.
- inheritance in *Nicotiana tabacum*, 752.
- penetration into bodies of insects, 656.
- poisoning of cows, 692.
- toxicity, effect of different salts, 503.
- vapor for codling moth control, 508.

Nigrospora sp., notes, Fla. 354.*Nippostrongylus muris*, development, 251.

Nitrate—

- fertilization, effect on apple fruits, 186.
- levels, declining, in Putnam silt loam, 299.

Nitrification, bacterial, in tropical countries, 164.

Nitrification, newer aspects, 163.

Nitrogen—

- assimilation by legumes, 27.
- carriers, S.C. 759.
- carriers in Baldwin orchard, N.Y.State 617.
- distribution in milk, effect of protein feeding, 524.
- effect on composition and yield of pasture herbage, 608.
- effect on growth and nitrogen content of wheat and rice, 761.
- effect on root growth, [N.Y.]Cornell 773.
- excretion in feces, effect on ratio of fat and carbohydrate in, 874.
- fertilization for orchards, 338.
- fertilizer studies, catalysts in, U.S.D.A. 448.
- fixation and photosynthesis in leguminous plants, relation, Wis. 448.
- fixation by *Azotobacter*, 163; U.S.D.A. 448.
- fixation by clover plants, statistical study, 459.
- fixation by nonsymbiotic micro-organisms, Iowa 743.
- fixation, effect of potassium nitrate, 459.
- forms in infusions of specific plants, 150.
- in proteins, 5.
- in soil, determination, rapid method, 155.
- metabolism of normal and leaf roll potatoes, 205.
- metabolism studies, improved stall for, 673.
- nonprotein, constituents of human milk, 871.
- relation to composition, growth, and yield of wheat, Wash. 473.
- seasonal cycles in fruit trees, 479.

Nitrogen—Continued.

- sources for cotton, effect on fruiting and organic constituents, Ga. 38.
- top-dressing experiments, Ind. 13.
- transport in cotton plant, 459.
- trichloride as fungicide, 633.
- trichlorite gas, use against citrus storage and transit decay, Calif. 634.
- urinary, excretion by mature animals and body weight, Mo. 824.
- Nitrous acid reaction with cystine and related sulfur-containing compounds, 437.
- Nodonota puncticollis*, see Rose leaf beetle.
- Nodule formation—see also Legumes, inoculation.
 - decreased, on legumes supplied with nitrogen, 20.
 - effect of potassium nitrate, 459.
 - of clovers, effect of shelled and unshelled seeds, 761.
- Nodules of legumes, form and effect in different strains, 317.
- Nomadacris septemfasciata*, notes, 502, 656, 811.
- Nonlegumes, inoculation, commercial cultures, Iowa 743.
- North Dakota College, notes, 895.
- North Dakota Station, notes, 575, 895.
- Notocotylus hassalli* n.sp., notes, 214.
- Nun moth, ecology, 216.
- Nun moth, studies, 813.
- Nursery—
 - inspection, law and regulations, Conn. [New Haven] 429.
 - seed bed, expression of dominance after twenty years, 193.
 - stock, balled, treating for earwig, 361, 654.
 - stock, insects affecting, N.Y.State 654.
 - stock, transportation in United States and Canada, regulations, Conn.[New Haven] 429.
 - stock, winter injury, N.Y.State 617.
- Nurserymen's tape, suitable antiseptic for, Wis. 489.
- Nut trees, native, promising species, N.Y. State 627.
- Nutrient deficiencies, Pa. 823.
- Nutrient deficiencies, effect on utilization of energy producing nutriment and protein, 371.
- Nutrients, dynamic effect, Pa. 823.
- Nutrition—
 - and hyperthyroidism, Ark. 885.
 - animal, see Animal nutrition.
 - in health and disease, 865.
 - modern problems, character, 413.
 - newer trends in, 278, 865.
 - of rats, role of zinc in, Wis. 560.
 - plant, see Plant nutrition.
 - relation to disease, 890.
 - studies, Wis. 559.
 - textbook, 865.
- Nuttalliasis, gonacrine for treatment, 694.
- Nygmia phacorrhoea*, see Brown-tail moth.
- Nyssa ogeche* as source of tupelo honey, 666.

Oak—

- forests, composition, 193.
- heart rot, cause, 356.
- seedlings, development, relation to acorn weight, 193.

Oaks—

- chestnut, seed productivity in southern New Jersey, 487.
- pin, growth, 784.
- pin, growth experiments, 192; [N.Y.] Cornell 782.
- pin, recent developments in Cornell experiments, 784.

Oat—

- and pea silage, *see* Silage.
- crown rust, physiological specialization and parasitism, Iowa 787.
- crown rust resistant strains, production, Iowa 787.
- feed v. oat straw for dairy cattle, Mich. 243.
- hulls, digestibility, 517.
- seed treatments, effect, 470.
- seedlings, effect of substance from ripe apples, 621.
- smut, control, N.J. 60.
- smut fungi, inheritance of chlamydospore characteristics in, 630.
- smut resistance, inheritance in hybrids, 62.
- smuts, seed-borne, dust fungicides for control, Iowa 787.
- stem rust resistance, 631.

Oats—

- aberrant types including fatuoids, origin, 599.
- and legume mixtures for hay, tests, Calif. 606.
- as pasture crop, 319.
- as substitute for wheat bran and midlings in starting rations for chicks, 237.
- breeding, Ga.Coastal Plain 757; Idaho 34; Iowa 757; N.J. 35; [N.Y.] Cornell 758; Nebr. 758; U.S.D.A. 605.
- breeding for immunity or resistance to smuts, Mo. 466.
- breeding in Scotland, 470.
- certified seed production, rules and requirements for, N.J. 616.
- culture experiments, Ga.Coastal Plain 757; Wyo. 606.
- culture in Imperial Valley, Calif. 34.
- diseases in Arizona, key, Ariz. 346.
- effect of artificial injury, Iowa 757.
- fertilizer experiments, Fla. 316; Ga. Coastal Plain 757.
- foot rot in Oregon, 491.
- growth, effect of copper sprays, N.H. 476.
- Heterosporium* of, symptoms, 789.
- hybrids, smut and rust resistant, Wis. 467.
- prices and index numbers, Mich. 124.
- rotation experiments, U.S.D.A. 759.
- sprouted, feeding to irregularly breeding animals, Hawaii 371, 376.

Oats—Continued.

- varieties and strains, registration, 764.
- variety-cultural experiments, Iowa 757.
- variety tests, Ark. 756; Fla. 316; Ga. Coastal Plain 757; Idaho 34; Ind. 35; Iowa 757; Mo. 466; N.J. 35; Nebr. 758; S.C. 759; U.S.D.A. 759; Utah 316; Wyo. 606.
- winter hardiness in, 470.
- winter, vernalization formulas, 610.
- Obeliscoides cuniculi*, notes, 699.
- Oberea linearis*, injury to walnut groves, 665.
- Oberly Memorial Prize, 144.
- Oceanography, physical, and weather forecasting, 447.
- Odoiporus longicollis*, notes, 808.
- Oesophagostomum*—
 - dentatum*, notes, 688.
 - spp., larvae, effect of copper sulfate, 214.
- Oestrin, distribution and source in pregnant mare, 314.
- Oestrus in cattle during pregnancy, 104.
- Oestrus ovis*, *see* Sheep botfly.
- Ohio Station, notes, 575.
- Oil—
 - emulsions, comparative oil deposits, 77.
 - emulsions, insecticidal efficiency, factors affecting, 76.
 - spray, atomized, machinery for applying, 544.
 - spraying of fruit trees, tank-mixture method, Calif. 360.
 - sprays for airplane vapor spraying, 360.
 - sprays, value of tank mixture, Calif. 654.
- Oils—*see also* *Fats and specific oils*.
 - drying, from safflower, U.S.D.A. 616.
 - essential, of fruits and tropical plants, preparation, P.R. 150.
 - lubricating, friction tests, 704.
 - lubricating, tests, 264.
 - mineral, soybean oil meal as emulsifier, 219.
 - petroleum, on apple, penetration, distribution and effect, 498.
 - petroleum, penetration into insect eggs, technic for tracing, N.H. 504.
 - petroleum, unsaturated, as insecticides, 657.
 - production, trade, and consumption, 1912-1933, U.S.D.A. 121.
 - rancidity, relation to light of various wave lengths, 867.
 - spray tests with, Ky. 74.
 - tar and petroleum, ovicidal efficiency, 505.
- Oilseed crops, breeding and other research, 606.
- Okra, spineless, breeding, S.C. 769.
- Oleaceae cuttings, method of inducing knots on, 632.
- Olfactometer, insect, requirements and design, 367.

Olive—

knot, control with bordeaux mixture, 634.

knot, development and control, 632.

Russian, performance, Nebr. 769.

Olives—

cured ripe, preserved at low temperatures, behavior, 626.

processing, elimination of defects in, Calif. 719.

varieties, 779.

Omnivorous looper, life history and control, Calif. 654.

Omphalia sp. on tissues of date palm, parasitic action, 633.

Onion—

disease resistant variety, 640.

insects, biology and control, Iowa 806.

purple blotch, control, Colo. 787.

scales, color and thickness, effect of

copper sulfate, [N.Y.]Cornell 770.

seed, preservation, U.S.D.A. 616.

seedling blight and bulb rot, control, Iowa 788.

smut, control, [N.Y.]Cornell 788.

smut, control, formaldehyde dust for, Ohio 801.

thrips, control, Colo. 806.

thrips, fungus attacking, 73.

thrips in California, winter study, 658.

thrips, life cycle compared with other thrips, 506.

thrips, studies, Fla. 358; [N.Y.]Cornell 807; S.C. 807.

thrips, transmission experiments of potato yellow dwarf with, 640.

thrips, vector of tomato spotted wilt, 66.

Onions—

breeding and storage, Colo. 768.

bulb size, relation to thickness of outer scales, 185.

double and scallion, formation, Utah 327.

fertilizers for, [N.Y.]Cornell 770.

insect- and disease-resistant, breeding, Calif. 616.

irrigation requirements, indexes, 183.

keeping quality, Utah 327.

premature seeding, [N.Y.]Cornell 770.

soil and cultural requirements, Calif.

46.

varieties, relative firmness, 185.

variety standardization, Utah 327.

Oniscus asellus, notes, 229.

Oonopsis condensata, poisonous to livestock, Wyo. 689.

Ophiobolus—

graminis, ascospore discharge in, 350.

miyabeanus, autolysis in, 197.

phytopathological and taxonomic aspects, 635.

Ophtonyssus serpentium, notes, 370.

Ophthalmia, relation to vitamin A deficiency, 418.

Ophthalmomyiasis, conjunctival, cause, 688.

Opihi, vitamin D in organs and hemoglobin regenerating value, Hawaii 413.

Orange—

bagworm, predatory habits, 654.

juice and ascorbic acid, antiscorbutic potency, comparison, 586.

juice, freezing, 740.

juice, pasteurization, U.S.D.A. 436.

juice, preparation, Calif. 719.

maggot, *see* Fruit fly, Mexican.

trees, chlorosis, relation to mineral constituents, 748.

trees, frenching, 593.

trees, nitrogen in, distribution, 627.

Trichoderma rot, type, 633.

Oranges—

combined effect of *Diplodia* and green mold inoculations on, 802.

fertilizer experiments, 780.

fruit thinning, effects, U.S.D.A. 616.

insect pests in Formosa, 820.

pectic constituents, Fla. 5.

Satsuma, adaptability tests, S.C. 769.

Satsuma, coloring, U.S.D.A. 616.

Satsuma, maturity and quality, 781.

Satsuma, rootstocks for, Fla. 327.

storage, 52.

storage, effect of ammonium bicarbonate, 210.

studies, P.R. 182.

thinning effects, Calif. 191.

Valencia, cold storage, Fla. 327.

vitamin C in compared with apples of Czechoslovakia, 569.

Washington Navel, variation in fruits and standardization, 342.

Orchard—

grass seeds, weight for 1,000, Md. 45.

insects in Massachusetts, 358.

insects of importance, 216.

soils, frost penetration, Ohio 47.

soils, redox potential measurement, 618.

trees, deficiency diseases, relation to soil and tree treatments, Calif. 634.

Orchards—*see also* Fruits, Apples, Peaches, etc.

fertility studies, 338.

fertilizing, irrigating, and cover cropping, Calif. 616.

management, Colo. 768; Ind. 47.

New Jersey, soil reactions in, N.J. 47.

spraying, labor and equipment used in, 187.

starting, Mo. 774.

Oregon College, notes, 895.

Oregon Station, notes, 895.

Organic compounds, synthetic, insecticidal tests with mosquitoes, 503.

Organic matter—

accumulation in soils, Mo. 448.

decomposition, determining degree of 747.

for soil improvement, N.J. 14.

in apple orchards, N.Y.State 617.

in soil, functions, 19.

- Organic matter—Continued.
rate of decomposition under field conditions, 315.
- Organisms, *see* Bacteria and Micro-organisms.
- Orioles and blackbirds, 652.
- Ornamental plants, shrubs, and trees, *see* Plants, Shrubs, and Trees.
- Ornithodoros turicata*, vector of relapsing fever in Texas, 250.
- Orthoptera of Illinois, 658.
- Oryzaephilus surinamensis*, *see* Grain beetle, saw-toothed.
- Oryzanin, isolation from yeast, 154.
- Osage-orange, planting experiments, Ark. 784.
- Osteomyelitis wounds, treatment with blow-fly larvae, 815.
- Ostertagia* spp., notes, 694.
- Ottawa trade agreements, 856.
- Ova, mammalian, development in vitro, 314.
- Ovaries—
differential response to follicle-stimulating hormone, 465.
effect of pregnancy, 313.
immature, transplanted in eyes of adult male and female rats, 314.
weight increase, effect of combination of pregnancy urine extract and extract of sheep hypophysis, 34.
X-ray treatment, effect on subsequent pregnancies, 604.
- Ovens, heating process, relation to utensils, 574.
- Ovulation—
artificially induced, in cats, 466.
in hens, 466.
- Owls—
American, key to species, 805.
great horned, food habits, Iowa 804.
great horned, undetermined virus as cause of death, 699.
illustrated account, 805.
- Ox serum, vitamins A and B in, 564.
- Ox warbles—*see also* Cattle grubs.
control, Mo. 501.
- Oxalic acid in foods, 875.
- Oxidation-reduction potentials, measuring, 524.
- Oxides, hydrous, isoelectric point and ionic exchange, 450.
- Oxygen balance and root respiration, Fla. 347.
- Oyster-shell scale—
density of population and sterility of females, 812.
notes, Mont. 807.
- Oysters—
hydrography, setting, and food, N.J. 73.
storage and conditioning for market, N.J. 73.
- Ozontum texanum* n.sp., description, 349.
- Paederus fuscipes*, life history and seasonal abundance, 230.
- Paint on wood treated with zinc chloride, durability, 543.
- Painting exterior woodwork, U.S.D.A. 543.
- Palm—
coconut, *see* Coconut.
kernel meal, feeding value, 675.
- Palpobooophilus* n.subg., taxonomy and morphology, 670.
- Pampas grass for dairy cows, 96.
- Panicum grass, green, v. green Sudan grass for dairy cows, Hawaii 831.
- Panolis flammea*—
control, meteorological observations in the course of, 216.
in 1931 in Lorenzer State Forest, 217.
parasites, pupation, 217.
- Papaws, storage, 52.
- Papayas, feeding value, Hawaii 371.
- Papayas, propagation, 483.
- Paper deterioration, U.S.D.A. 436.
- Paper mulch tests, results, effect of soil type, 183.
- Paradidyma*, key for separation of species and description, 815.
- Paradise tree, planting experiments, Ark. 784.
- Paralysis, fowl, etiology, 843.
- Paralysis—
fowl, etiology, 843.
fowl, leucocytes of blood in, 109.
fowl, studies, 109, 258; Idaho 102.
fowl, transmissible strains of virus, 108.
infectious bulbar—*see also* Pseudorabies.
in dogs and small laboratory animals, 382, 837.
in swine, 534.
pathology and differentiation from rabies, 536.
range, in chickens, Iowa 843.
- Parasites—
animal, studies, 213.
animal, tactics and strategy of warfare on, 529.
animal, treatment for, U.S.D.A. 528.
cryptogamic, effect of climatic factors in 1933 and 1934, 489.
ecto- and endo-, papers on, 688.
helminth and arthropod, studies, 528.
ichneumonoid, from pests in Russia, 217.
of cattle in Puerto Rico, P.R. 531.
of domestic and wild animals, interrelation, Wyo. 689.
reared, and hosts, 360.
shipments to foreign countries, U.S.D.A. 652.
- Parasitism and disease, lectures on, 249.
- Paratetranychus pilosus*, *see* Red mite, European.
- Paratheresia*, notes, Fla. 358.
- Parathyroid extract and viosterol, effects of moderate doses, 889.

Paratrioza cockerelli—

big-eyed bug as predator, 812.
control, 225.

induced immunity in plants to, 656.

Paratuberculosis, *see* Johne's disease.

Paratyphoid in ducks, 698.

Paratyphoid infection of canaries, 845.

Paratyphoid of pigeons, immunization, 845.

Paratyphoid of pigeons in Egypt, 698, 845.

Paris green—

and molasses spray, effect on gladiolus
thrips, 223.

mixtures, automatic distributing ma-
chine for, 220.

permanence on mosquito infested stag-
nant pools, 662.

Parlatoria date scale—

external anatomy, U.S.D.A. 507.

quarantine work with, U.S.D.A. 653.

Parsley, New York market prices, N.J. 124.

Parsnips—

culture and fertilizers, [N.Y.]Cornell
477.

New York market prices, N.J. 124.

vegetative organs, anatomy, 330.

Passalurus ambiguus, notes, 699.

Passion flowers, perforated fiber-tracheids
in, 459.

Pastes, alimentary, manufacture, experi-
mental equipment for, 868.

Pasteurella—

equiseptica-like strains from brains of
horses suffering from cornstalk dis-
ease, 841.

in animals, inter-classification, 530.

infection in pigs, value of serum and
bacterin treatment, 107.

Pasteurization, *see* Milk.

Pasture—

grasses, *see* Grasses.

grazing test, plan and preliminary re-
sults, 243.

herbage, effect of temperature of arti-
ficial drying, 523.

mixtures, tests, Idaho 35, 95; N.J. 35.

plant proteins, cystine in, 581.

plants, vitamin A in, Idaho 137.

plats, yield and quality, effect of fer-
tilizers, 516.

soils of Vermont, potash and phos-
phorus in, Vt. 15.

Pastures—*see also* Grasses, Grassland, and
Meadows.

as means of decreasing feed and food
surplus, U.S.D.A. 87.

bluestem, characteristics, 175.

bluegrass, grazing systems, Mo. 514.

carrying capacities, effect of nitrogen
fertilization, N.J. 95.

comparison, 523.

composition, effect of management,
Idaho 35.

cooperative fertilizer experiments, N.J.
35.

effect of fertilizers and methods of
grazing, Iowa 743.

Pastures—Continued.

fertilization, 315, 523; Mo. 466; Pa
831.

grazing and fertilizer experiments, 317
green, effect, 524.

improvement, 242; Iowa 757; Mo.
448; [N.Y.]Cornell 318; Nebr. 758;
W.Va. 606.

management, [N.Y.]Cornell 303, 318.

management, close-grazing scheme, 608.
native v. improved, burned v. un-
burned, Fla. 316.

North Dakota, continuous v. deferred
grazing for, U.S.D.A. 605.

of Northern Nigeria, composition, 515.
of Suffolk and Nassau Counties, im-
provement and management, [N.Y.]

Cornell 37.

on upland soils, studies, Ala. 760.

permanent mixed grass, establishment,
U.S.D.A. 759.

phosphorus and calcium content,
[N.Y.]Cornell 758.

place in Iowa farming, Iowa 709, 854.

regularly grazed, lower grub count,
Wis. 502.

response to fertilizers, U.S.D.A. 605.

response to fertilizers and lime, Ind.
35.

soil beneath, viable seeds in, 45.

studies, Ark. 757; Ga.Coastal Plain
757, 825; Wis. 466; Wyo. 606.

vegetation and exchangeable bases, Mo.
448.

yield and composition, effect of fer-
tilizers, 315.

Patana oil, studies, U.S.D.A. 436.

Patents relating to insect traps, U.S.D.A.
502.

Pavements, *see* Concrete and Roads.

Pea—

aphid, studies, N.Y.State 654; U.S.D.A.
653.

Ascochyta spot, symptoms, 789.

diseases, control, Calif. 634; U.S.D.A.
640.

diseases in Arizona, key, Ariz. 346.

Fusarium disease, 64.

Fusarium wilt, relation to soil types,
Wis. 489.

Fusarium wilt resistance, relation to
soil fertility, 632.

leaf, stem, and pod spot, 497.

Pods, carbon dioxide in, 51.

root rot and other diseases, Idaho 60.

root rot, effect, 630.

root rot, relation to soil fertility, 632.

rust in Massachusetts, U.S.D.A. 59.

seeds, germinating, black spot of, 353.

weevil, U.S.D.A. 653.

weevil field populations, effect of for-
ested areas, 368.

weevil, survival out of doors, Idaho 74.

wilt, cause, 630.

wilt, new, 498.

Peach—

- aphid, green—
 - life history and control, 225.
 - notes, 218.
 - transmission of potato yellow dwarf, 640.
 - bacterial spot, effect of zinc sulfate, U.S.D.A. 59.
 - bark beetles and winter injury, N.Y. State 666.
 - borer, biological control, N.Y.State 654.
 - borer, control, 79.
 - borer, lesser, summary, S.Dak. 79.
 - buds, hardiness, Ohio 47.
 - disease, new, called the 1933 disease, Calif. 634.
 - disease, phony, quarantine against, U.S.D.A. 634.
 - diseases in Virginia, 210.
 - embryo, growth, 621.
 - leaf curl, control, 345.
 - leaf curl, creosote oil for, 78.
 - mosaic, 630.
 - mosaic in Colorado, U.S.D.A. 59.
 - mosaic in Palisade district, Colo. 787.
 - Phoma* canker, symptoms, 789.
 - phony disease, U.S.D.A. 633, 634.
 - pits, splitting, studies, 190.
 - seedlings, resistance to nematodes, Calif. 616.
 - seeds after-ripening, effect of low temperatures, 478.
 - seeds, development, physiology, N.Y. State 617.
 - seeds, nonviable, germination, 339.
 - tree buprestid, biology and control, 665.
 - trees, flower bud development, effect of rest period, 188.
 - trees, soil-borne parasites on, 631.
 - trees, training, Ark. 768.
 - trees, winter injury, protection from, 622.
- Peaches—
- breeding, Calif. 616; N.J. 47.
 - chlorosis of, 637.
 - effect of potassium-carrying fertilizers, 185.
 - Elberta, dimensions, relation to volume, 189.
 - Elberta, fruit bud level in, 188.
 - Elberta, fruit-seed dimensions, 189.
 - fertilization, Ark. 768; U.S.D.A. 448.
 - for preserving and canning, U.S.D.A. 616.
 - fruit bud killing, comparative resistance, W.Va. 617.
 - fruit growth, 189.
 - fruit thinning, effects, U.S.D.A. 616.
 - gumming of fruit, control, Calif. 616.
 - hardiness of varieties, N.J. 47.
 - iodized wraps for prevention of rotting, 773.
 - metabolism, effect of temperature, N.J. 47.
 - new, testing, S.C. 769.

Peaches—Continued.

- Paloro, fruit size and yield, relation to pruning and thinning, 622.
 - root distribution, Ark. 768.
 - Shalil, immunity to nematodes, U.S. D.A. 616.
 - thinning, Ohio 47, 621.
 - varieties, S.C. 769.
 - varieties for freezing preservation, N.J. 47.
 - varieties, improved, Iowa 769.
 - variety tests, Ga.Coastal Plain 768; Utah 327.
 - winter injury of 1933-34, N.Y.State 333.
 - winter injury to, Pa. 769.
- Peanut meal, feeding value, 675.
- Peanuts—
- breeding, 315; Fla. 316; Ga.Coastal Plain 757.
 - culture experiments, Fla. 316; Ga. Coastal Plain 757.
 - culture in Imperial Valley, Calif. 34.
 - fertilizer experiments, Ga.Coastal Plain 757.
 - soil amendments, Fla. 316.
 - variety tests, Ark. 756; Fla. 316; Ga. Coastal Plain 757; P.R. 174.

Pear—

- bacterial canker, new to California, 355.
- fire blight, control in the bloom, [N.Y.] Cornell 788.
- fire blight, relation to growth status of tree, N.J. 209.
- fire blight, use of bordeaux mixture for, Ark. 787.
- orchards, irrigation, U.S.D.A. 480.
- orchards, Oregon, role of moisture in, U.S.D.A. 616.
- rot in France, 499.
- scab pathogen, seasonal development, [N.Y.] Cornell 788.
- scab, spraying experiments, 68.
- seedlings, growth, effect of size and of seed parent, 480.
- seeds after-ripening, effect of low temperatures, 478.
- stocks in New York, tests, 480.
- thrips, abundance and control, 362.
- thrips, control, Calif. 654.
- thrips injury to apple, 507.
- tree borer, sinuate, feeding habits, relation to control, N.Y.State 367.

Pears—

- Bartlett—
 - fertilizer experiments, 190.
 - maturity and handling, relation to quality of canned product, U.S.D.A. 777.
 - refrigerated transportation, U.S. D.A. 337.
 - shape, relation to environment and rootstocks, Calif. 616.
 - xenia and metaxenia in, 338.

Pears—Continued.

Bosc, vitamin B and vitamin G in, 727.

breeding, Iowa 769.

chromosome number and pollen germination in, 753.

cold storage, copper sulfate-treated paper wrapping for, 777.

culture in New York, N.Y.State 53.

diploid and triploid chromosomes in, behavior, 754.

French, as understocks, N.Y.State 774.

growth on various understocks, N.Y. State 617.

Kieffer, effect of ripening temperature, 621.

Kieffer, ripening, U.S.D.A. 616.

pollination, 618.

pollination and fruit setting, Ohio 47.

pollination, effect of spraying during bloom, 187.

retention of carbon dioxide gas in intercellular atmosphere, 479.

scion rooting, 332.

sod culture, Ohio 47.

spray residue removal, U.S.D.A. 616.

thinning, relation to yield and size of fruit, 621.

varieties, Fla. 327.

varieties, new, in Russia, 773.

variety tests, Ga.Coastal Plain 768; Ohio 47.

winter injury of 1933-34, N.Y.State 333.

Peas—

aberrations in composition from diseased plants, 796.

Austrian winter, fertilizer experiments, Fla. 316.

canned, maturity, 133.

canned, spoilage, N.Y.State 581.

culture experiments, N.Y.State 617.

culture in Imperial Valley, Calif. 34.

frozen, U.S.D.A. 436.

frozen pack, quality retention in, 477.

green-seeded, as sources of vitamin A in poultry, Idaho 88.

grown in water culture, carbohydrate-nitrogen and base element, relation, 50.

inoculation and germination studies, Idaho 35.

market, quality, effects of handling, [N.Y.]Cornell 51.

new wilt-immune Wisconsin Perfection, qualities, Wis. 477.

pigment, effect on yolk color, Idaho 88.

seed bed preparations, Utah, 317.

seed injury, effect on germination, 764.

seed, threshing injury, Calif. 700.

varieties, Pa. 769.

varieties, chromosome lengths in, 753.

variety tests, Idaho 34.

vernalization experiments, 607.

winter, culture experiments, Ga.Coastal Plain 757.

Peas—Continued.

winter, fertilizer experiments, Ga. Coastal Plain 757.

winter, variety tests, Ga.Coastal Plain 757.

young germinated, extracts, indophenol-reducing capacity and vitamin C in, 731.

Peat—see also Moorland soils.

ammoniated, possibilities, U.S.D.A. 21.

and muck soils, pasture studies on, Fla. 316.

as nitrogen carrier, U.S.D.A. 448.

changes in, effect of composting, 302.

moss, value for fruit tree seed planted in heavy soil, N.Y.State 774.

soils, control of ground water in, U.S.D.A. 699.

soils, sugar beet production on, Calif. 606.

Pecan—

aphid, black, control, 507, 812.

diseases, control, U.S.D.A. 633.

leaf casebearer, control, 509.

nut casebearer, control, 509.

nuts, germination, X-ray dosage, 484.

orchards, value of cover crops in Florida, 54.

roots, morphology and physiology, 54.

rosette, effect of zinc sulfate, 648; U.S.D.A. 59.

trees, coating with paraffin, value, 484.

weevil larvae, burrowing into soil, ineffectiveness of surface cultivation, 512.

Pecans—

and pecan oil, rancidity in, prevention, Fla. 413.

fertilizer experiments, Fla. 485; U.S.D.A. 448.

filling and maturity, 486.

grafting, U.S.D.A. 616.

growth and reproduction, relation to nitrogen absorption and storage, Fla. 327.

growth rate studies, 484.

injury from bordeaux mixture, 649.

research, Fla. 326.

root growth and development, 485.

size, filling, and composition of kernels, relation to cultural treatment, 485.

soil and cultural requirements, Calif. 46.

variety tests, Ga.Coastal Plain 768; Mo. 476.

Pectin—

and pectic enzymes, chemistry, N.Y.State 581.

in citrus fruits, Fla. 5.

Pectinophora gossypiella, see Bollworm, pink.

Penicillium—

digitatum and *Diplodia natalensis* on oranges, combined effect, 802.

expansum, studies, Wash. 354.

gladioli, control, 648.

Penicillium—Continued.

- humicola*, spore germination, Iowa 787.
- parasitic upon *Aspergillus niger*, action on sucrose solutions, 438.
- Pennsylvania College, notes, 575.
- Pennsylvania Station, report, 894.
- Penthaeus bicolor*, notes, 218.
- Penthaeus major*, notes, 670.
- Peony *Botrytis* blight, symptoms, 789.
- Peony brown spotting, control, 70.

Pepper—

- anthracnose, symptoms, 789.
- diseases in Georgia, Ga. 801.
- maggot, studies, N.J. 74.
- pest, new to United States, 818.
- spotted wilt virus disease, Calif. 634.
- weevil, studies, U.S.D.A. 511, 653.
- wilt, testing for resistance to, Colo. 787.

Peppers—

- pimiento, feeds from, relation of egg yolk color, Ga. 93.
- pimiento, fertilizer experiments, P.R. 182.
- results from paper mulch tests, effect of soil type, 183.

Pepsin—

- inactivation by proteases, 294.
- proteolytic action, relation to tobacco mosaic virus, 799.

Pericystis alvei from Europe and related species from America, 513.*Peridermium strobi*, see White pine blister rust.*Periplaneta americana*, see Cockroach, American.*Peronea*, Canadian species, 509.*Peronospora*—

- effusa*, notes, 630.
- hyoscyami* downy mildew, Fla. 347.
- sp., notes, Ga. 801.
- viciae*, notes, U.S.D.A. 640.
- viticola*, control, 802.

Persimmons—

- Japanese, foliar reddening, 210.
- studies, Calif. 616.

Personality and diet, treatise, 279.

Pest control, patents relating to, U.S.D.A. 502, 808.

Pestalotia podocarpi n.sp., description, 637.*Pestalotia* spp., notes, N.J. 60.*Petaloccephala nigrilinea*, life history and morphology, 359.

Petroleum oil—

- distillates, effect on mealybugs, 505.
- ovicidal efficiency, 505.
- penetration into insect eggs, technic for tracing, N.H. 504.

Phacidiella discolor, notes, 499.*Phaedon incertum*, life history and control, 218.*Phanurus* sp., notes, 365.

Pheasant eggs, temperature requirements and humidity for incubation, [N.Y.] Cornell 651.

Pheasants—

- Chinese ringneck, nematode parasite in, 261.
- ecology, Iowa 804.

Pheidole megacephala, studies, [Hawaii] Pineapple Producers' 84.*Phellomyces sclerotiphorus*, relationship and distinction from *Spondylocidium atrovirens*, 798.

Phenology for agriculture, importance, 740.

Phenols action on urease, 153.

Phenyl isocyanate protein compounds, immunological properties, 436.

Phenylalanine in protein material, spectroscopic identification, 444.

Phlox, annual, star-shaped, colored center in, Pa. 755.

Phoma—

- betae*, notes, N.J. 60.
- canker of peach, symptoms, 789.
- destructiva*, notes, Fla. 346.

Phomopsis—

- citri*, notes, Fla. 347.
- sp., notes, 648.
- vexans*, notes, N.J. 60.

Phormia regina, early embryological development, 663.

Phosphate—

- fertilizers, preparation, U.S.D.A. 448.
- fixation in Hawaiian soils, Hawaii [Sugar Planters'] 305.
- response and Truog phosphate method, correlation, 315.
- rock, availability, Ark. 743.
- rock, ferrous iron in, 8.
- rock, for poultry, Wis. 515.
- rock, limitations as mineral feed for swine, Wis. 515.

Phosphates—

- available, *Cunninghamella* plaque method of measuring, 745.
- available, in calcareous soils, 452.
- colloidal, studies, 450.
- comparison, 23, 304.
- in soils, new biological test for, Wis. 448.
- rotation findings, Pa. 743.
- soil penetration, 452.

Phosphoric acid ions, adsorption by soils, 162, 451.

Phosphorus—

- availability, effect of soil reaction, Wis. 466.
- available, in Iowa soils, Iowa 743.
- fertilization for orchards, 338.
- fixation in difficultly available form, soil capacity for, 23.
- in alternate bearing sugar prune trees, 481.
- in blood of helpers, effect of age and phosphorus intake, 523.
- in pastures, [N.Y.] Cornell 758; Vt. 15.
- in soils of alkaline reaction, availability, Iowa, 743.
- metabolism in puppies deprived of parathyroid gland but treated with vitamin D, Wis. 559.

Phosphorus—Continued.

- partition in chicken blood, 238.
- requirements, U.S.D.A. 525.
- requirements of Maryland soils, Md. 14.
- solubility in Illinois soils, 746.
- sources, comparative value, Ind. 13.

Photometer, new, adapted to botanical purposes, 593.

Photoperiodism, internal mechanism, Mo. 456.

Photosynthesis—

- and nitrogen fixation in leguminous plants, relation, Wis. 448.
- in pea plant, factors affecting, Mich. 750.
- long and short wave-length limits, 56.
- of legumes, 27.

Phototropism—

- insect, economic importance in India, 655.
- relation to wave length, 595.

Phthorimaea heliopa, notes, 365.

Phthorophloeus liminaris, see Peach bark beetle.

Phyllocnistis citrella, studies, 662.

Phyllocoptes oleivorus, notes, 653.

Phyllophaga of Iowa, 230.

Phyllosticta sorghina, notes, Fla. 354.

Phyllosticta straminella, notes, 352.

Phyllotocidium macleayi, notes, 656.

Phymatotrichum omnivorum—

- longevity, effect of soil moisture, 794.
- losses from, 794.
- notes, 493, 494.
- root rot, immunity of monocotyledonous plants from, 345.
- soil treatments for, 633.
- strains, reversible vegetative dissociation, 345.

Physalis virginiana as wild host of tobacco wildfire, Pa. 789.

Physoderma zea maydis, notes, Fla. 346.

Phytalus smithi—

- and natural enemies in Barbados, 665.
- campaign against, 656.
- notes, 655.

Phyto melanocephala, biology and larval forms, 229.

Phytomonas—

- carotae* n.sp., description, 496.
- insidiosa*, notes, 492.
- spp., studies, [N.Y.]Cornell 195.
- woodii*, notes, [N.Y.]Cornell 788.

Phytophaga destructor, see Hessian fly.

Phytophthora—

- capsici*, notes, Colo. 787.
- chytridiaceous parasite of, 632.
- genus, classification, and identification of species, W.Va. 637.
- genus, morphological and physiological studies, Mo. 488.
- infestans—see also Potato blight, late and Tomato late blight.
- culture, 348.
- palmivora*, notes, 789.
- parasitica nicotianae*, notes, Fla. 347.

Phytophthora—Continued.

- sp., notes, Colo. 787.
- sp., zoosporangia production, nonsterile soil leachate for, 632.
- spp., physiologic specialization, 633.
- spp., sporulation, factors affecting, 633.

Pica in Nigerian cattle, cause, 516.

Pieris rapae, see Cabbage worm, imported.

Pigeonpea tops, green, feeding value, Hawaii 376.

Pigeonpeas—

- breeding, Hawaii 316.
- inheritance of characters, 599.
- insect pests, 656.

Pigments—

- inhibitive action on rusting, 848.
- natural, and vitamins, 280.
- plant, as sources of vitamin A, Fla. 413.

Pigs—see also Sows and Swine.

- age, relation to cost of pork production, 677.
- and corn, elasticity of supply for different farming areas, Iowa 854.
- costs and returns, Ky. 118.
- defective skulls, inheritance, 602.
- effect of fasting, Mo. 515.
- fall, fattening for spring market, Fla. 371.
- fattening, comparison of grains, Wyo 671.
- fattening forages for, S.C. 823.
- fattening on alfalfa pasture, corn supplements, 677.
- fattening rations, [N.Y.]Cornell 822; Nebr. 822.
- feeding experiments, U.S.D.A. 827.
- feeding on concrete floors, Mo. 514.
- grazing crops v. dry lot feeding, Fla. 371.
- growing and fattening in dry lot, limited feeding v. full feeding for, [N.Y.]Cornell 822.
- inbreeding, Iowa 755.
- inverted nipples in, 602.
- Iowa, packer demand for, Iowa 854.
- marketing in Corn Belt, relation to local livestock markets, Ill. 858.
- milk products in fattening rations, Utah 371.
- minerals for, P.R. 233.
- on rape pasture, skim milk v. whey for, Wis. 515.
- on southern pastures, self-feeding v. limited feeding, 370.
- poisoning with *Crotalaria spectabilis* seed, 695.
- potatoes in rations, 677.
- prices and index numbers, Mich. 124.
- production, economics of, Ky. 118.
- protein feeds for, comparison, Wis. 515.
- raising, contaminated v. clean ground, Ky. 88.
- types, comparison, U.S.D.A. 514.
- vaccinal immunity in, maternal transmission, 107.
- young, feeding, Calif. 273.

Pimientos, *see* Peppers.

Pine—*see also* White pine.

beetle, southern, relation to blue stain fungi, 665.

beetle, western, effect of bark temperature in subzero weather, 511.

beetle, western, effect on fire injured trees, 808.

blister rust, *see* White pine blister rust
5-needle species, susceptible to blister rust, 71.

loblolly, diameter distributions for old-field stands in Maryland, 629.

lodge pole, failure of plantings, soil factors in, 193.

longleaf—

effect of flower production on growth rate, 786.

growth, effects of three annual fires, 344.

resistance of saplings and seedlings to *Septoria acicola*, 803.

second-growth, bark thickness, 193.

seedlings, annual ring formation, 598.

moisture distribution in, 344.

noctuid control, meteorological observations in the course of, 216.

noctuid in 1931 in Lorenzer State Forest, 217.

noctuid parasites, pupation, 217.

Norway, release from aspen competition, 786.

performance, Nebr. 769.

pitch, on Cape Cod, value and resistance to gypsy moth defoliation, 786.

plantations, thinning, silvicultural effect, Vt. 55.

planting experiments, Ark. 784.

ponderosa—

clean cutting v. selective cutting, 344.

growth rate in Estes Park, 344.

infested with pine beetle, relation to air and bark temperatures, 511.

virgin stands, growth, 487.

red, *Phytophthora* root and collar disease, U.S.D.A. 633.

red, survival and growth, effect of weeding, 487.

root studies, Ark. 784.

seedlings, brown spot disease, U.S.D.A. 633.

seeds, germination, effect of moisture in, 56.

shoot moth, European, control, N.J. 74.

spinner, ecology, 217.

timber, blue stain in, prevention, 650.

Pineapple—

bran, feeding value, Hawaii 373, 376.

bran v. beet pulp as source of succulence for dairy cows, N.J. 95.

juice, fresh, vitamin C in, Hawaii 413.

Pineapple—Continued.

juices, sugar in, estimation, Hawaii Pineapple Producers' 11.

leaf spot, notes, 630.

leaves, thickness, diurnal fluctuation and water deficit shrinkage, 593.

pests, control, 808.

white spot in Puerto Rico, P.R. 195.

Pineapples—

field experiments with, experimental error, 782.

storage, 52.

studies, P.R. 182.

Pink bollworm, *see* Bollworm, pink.

Pinus spp., water and mineral requirements of seedlings, Ark. 784.

Piperidine, penetration into bodies of insects, 656.

Pipes, flow of water around bends in, 110.

Piricularia oryzae—

development, effect of soil temperature, 201.

effect of iron sulfate, 198.

physiologic specialization in, 201.

studies, 202.

Piroplasmoses—

gonacrine for treatment, 694.

of Carnivora, 530.

Pistol casebearer control, W.Va. 654.

Pituitary—*see also* Hypophysis.

anterior, effect on gestation in rabbits, 313.

anterior, two antagonistic hormones, 464.

extracts, effect on ovaries of infantile rabbits, 313.

hormones, effect on milk production in cows, U.S.D.A. 463.

Plagiorynchus formosus, new bird hosts, 214.

Plant—

as milites, direction of movement, 458.

breeding—*see also* Hybridization and specific plants.

application of genetical science to, 320.

in Russia, 461.

studies, Calif. 616.

bugs, larger, on citrus and truck crops, Fla. 358.

bugs, tarnished and superb, relation to alfalfa seed production, Utah 359.

cell—*see also* Cell.

size and structure, effect of inorganic elements, Vt. 306.

wall thickening, methods, 594.

walls, structure, 749.

cells, living, absorption and accumulation of solutes, 458.

cells, water relations, 458.

chromosomes, *see* Chromosomes.

cuttings, rooting, relation to moisture, 782.

disease survey in Everglades, Fla. 347.

disease survey in Puerto Rico, P.R. 195.

Plant—Continued.

- diseases—*see also* Fungi and different host plants.
 and weather, U.S.D.A. 346.
 eradication, U.S.D.A. 634.
 new attack on, N.Y.State 635.
 new or unusual, in Mississippi, 346.
 resistance and acquired immunity in, 789.
 virus, Mo. 488.
 virus, bibliography, 490, 790.
 genetics, bibliographical monograph, 309.
 growth and injury on peat and muck soils, role of special elements in, Fla. 347.
 growth, dew as factor, 740.
 growth hormone, pea test for, 457.
 growth in association with micro-organisms, pure-culture technic for studies, 630.
 growth in cloth houses, 327.
 growth, relation to ion absorption, N.J. 26.
 improvement project, international, report, 756.
 inspection, *see* Nursery inspection.
 material, decomposition, preferential utilization of nitrogen forms, 748.
 material imported for testing, U.S. D.A. 166, 598.
 nuclei, studies, 593.
 nutrients, chief, functions, N.C. 304.
 nutrition, disturbances due to chloride assimilation, Fla. 347.
 patents, new law and Patent Office practice, 182.
 pathology, research at University of Philippines, 789.
 physiology, research at University of Philippines, 593.
 pigmentation, *see* Pigments.
 protection and agricultural research, coordination in East Africa, 789.
 shipments, freed from diseases and pests, U.S.D.A. 74.
 temperatures and thermal emissivity, relation, 595.
 temperatures within bags, effect of materials and colors, 770.
 tissues affected by viruses, cytology, 58.
 tissues, reaction to soft-rot bacteria, 631.
 virus diseases, 197.
 viruses, purified, electrophoretic studies, 629.

Plantain—

- stem weevil, control, 808.
 variety tests, P.R. 182.

Plants—*see also* Flora and Vegetation.

- Connecticut, quarantine measures restricting shipments, Conn.[New Haven] 429.
 differently nourished, low temperature studies, 595.

Plants—Continued.

- dioecious, hermaphrodite, and monoecious forms, production, 593.
 drift of potassium and calcium with age, 594.
 economic, treatise, 165.
 fertilizer needs, rapid chemical tests for, Ind. 303.
 fiber, *see* Fiber.
 fish-poisoning, U.S.D.A. 502.
 flowering, temperature as factor, 182.
 green, vitamin D in, 887.
 greenhouse, control of environment, 751.
 greenhouse, culture and nutrition, N.J. 47.
 hybridizing with remotely related species, effects, 593.
 immunity and anticancer vaccination therapy in, 636.
 immunity to sucking insects, insecticidally induced, 656.
 injurious, biological control, 807.
 injury by cicadas, 362.
 iron in, distribution, 167.
 of maternal type, origin in interspecific hybridizations, 169.
 ornamental, culture, N.J. 47.
 ornamental, diseases, control, N.J. 60.
 ornamental flowering, naturally infected with curly top, Calif. 348.
 ornamental, insects affecting, Mont. 807; N.J. 74; N.Y.State 654.
 ornamental, *Sclerotium* stem rot of, 210.
 ornamental, soil and cultural requirements, Calif. 46.
 ornamental, spotted wilt virus disease, Calif. 634.
 ornamental, tests, Hawaii 327.
 Palestinian, fauna of, 359.
 photoperiodic effects in, relation to composition, 456.
 photosynthesis, *see* Photosynthesis.
 phylogenetic taxonomy, 30.
 poisonous—*see also* Livestock poisoning and specific plants.
 in Union of South Africa, toxicity, 529.
 of North Australia, 689.
 of Wyoming activated by selenium, 251.
 to livestock, U.S.D.A. 528; Wyo. 381, 689.
 propagation by cuttings, Hawaii 182.
 radium assimilation, 589.
 range, nutritional qualities, Calif. 671.
 relation to soil moisture, 18.
 septorioses, studies, 210.
 sexual reproduction, relation to carotinoid pigments, 749.
 solutes in, translocation, 594.
 subtropical fruit, resistance to low winter temperatures, 627.
 transpiration, *see* Transpiration.
 transpirational response to bordeaux mixture, Ohio 490.

Plants—Continued.

- varietal resistance to insect attacks, [N.Y.]Cornell 807.
- windbreak, Utah 327.
- woody, *see* Woody plants.
- Plasma, protein-free ultrafiltrates, rapid method for obtaining, 156.
- Plasmodesmata problem, status, 593.
- Plasmodesms in leaves and stems of angiosperms, 458.
- Plasmodiophora*—
 - brassicæ infection of soils, determination, 637.
 - development in Cruciferae, effect of soil factors, 638.
- Platoeceticus gloverii*, notes, 654.
- Platynota stultana*, damaging green oranges in southern California, 364.
- Plectodiscella veneta*, notes, N.J. 69.
- Plenodomus meliloti* on roots of alfalfa and sweetclover, 796.
- Plesina maculata*, biology and larval forms, 229.
- Plesiothrips andropogoni* n.sp. and n.var., description, 811.
- Pleuromonas jaculans*, notes, 453.
- Pleuropneumonia of cattle, microphotography of living virus, 105.
- Plodia interpunctella*, *see* Indian meal moth.
- Plodia* spp., notes, 360.
- Plowing and diskings studies, Mo. 547.
- Plowing, electrical, tests, 399.
- Plum—
 - aphid, mealy, Calif. 654.
 - curculio, control on fruit trees, Conn. [New Haven] 429.
 - leaf miners, identification, 365.
 - rootstocks, nature and growth habits, 339.
 - rootstocks, new varieties for, 340.
 - rootstocks, propagation, complex experiment in, 339.
 - trees, gumming and death in Egypt, cause, 645.
- Plums—
 - breeding, Iowa 769.
 - Climax, growth and changes in composition, 623.
 - fermentation, N.Y.State 581.
 - fertility in, 53.
 - Grand Duke, ripening dates on various understocks, 481.
 - iodized wraps for prevention of rotting, 773.
 - pollination, Ohio 47.
 - top-working, 332.
 - varieties, new in Russia, 773.
 - variety tests, Ga.Coastal Plain 768; Utah 327.
 - winter injury of 1933-34, N.Y.State 333.
- Plutella maculipennis*, *see* Diamondback moth.
- Plywood—
 - as structural covering for frame walls, U.S.D.A. 395.
 - structural use, 262.

Pneumonia, fungal, in fowls, 260.

- Pnyxia scabiei*, biology and morphology, 663.
- Poa compressa*, germination, factors in, U.S.D.A. 605.
- Podsol soils, titanium dioxide in, 162.
- Poison ivy—
 - description and remedial measures, 616; N.Y.State 616.
 - eradication, N.Y.State 616.
- Poisonous plants, *see* Livestock poisoning.
- Plants, poisonous, and specific plants.
- Polariscope, new type for study of welded joints, 702.
- Pollen—
 - germination in pears, 753.
 - grains, germination and vital staining of vacuoles, pH requirements, 597.
 - in hemp types, abnormalities in development, 749.
- Pollination, *see* specific plants.
- Polyarthritis of lambs, Calif. 689.
- Polymyxa graminis*, life history, morphology, and cytology, 631.
- Polyporaceae of New York State, 638.
- Polyporus* spp. causing heart rot of deciduous trees, 211.
- Pomegranates, soil and cultural requirements, Calif. 46.
- Pomoideae, origin, 311.
- Pomological research, normal frequency curve in, 477.
- Pontia rapae*, *see* Cabbage worm, imported.
- Popcorn, breeding, Iowa 757.
- Popcorn, variety tests, Iowa 757.
- Popillia japonica*, *see* Japanese beetle.
- Poplar—
 - diseases, [N.Y.]Cornell 788.
 - Dothiorella* canker, symptoms, 789.
 - Septoria* on, symptoms, 789.
 - tulip, planting experiments, Ark. 784.
- Poplars of Rocky Mountain region, characteristics, habits and distribution, U.S.D.A. 57.
- Poppy, classification and importance, 177.
- Population—
 - increase, effect on shape of demand curve, 854.
 - mobility in rural Connecticut, [Conn.] Storrs 412.
 - native white, interstate migrations among, U.S.D.A. 557.
- Porcellio scaber*, notes, 229.
- Pork—
 - muscle v. beef muscle in canned dried form as chief source of protein, Iowa 866.
 - prices in Canada, significance of demand, 715.
 - production, cost, relation to age of pigs, 677.
 - production, inheritance, 601.
 - quality and palatability, U.S.D.A. 671.
 - quality on corn-soybean rations, U.S.D.A. 87.
 - roasting, Mo. 560.

Porosagrotis orthogonia, see Cutworm, pale western.

Porthetria dispar, see Gypsy moth.

Potash—

availability in soil, relation to lime, S.C. 744.

deficiency, effect on carbohydrate elaboration in crops, Fla. 347.

effect of varying amounts and different carriers on citrus, Fla. 298.

fertilization on Maryland soils, Md. 14.

test, improvement, Wis. 448.

Potassium—

bromide, absorption by plant storage organs, 458.

chloride for side-dressing, rates of applying, S.C. 759.

deficiency, relation to photosynthesis, translocation, and protein synthesis in plants, Mich. 750.

effect on composition and quality of wheat, 615.

effect on composition of cowpeas and sugar beets, 165.

effect on firmness and keeping quality of fruits, 186.

effect on growth and yield in apples and peaches, 185.

excess, in diet, effect on growth and composition of rats, 417.

fertilizers, time and rate of applying to cotton, S.C. 759.

in irrigation waters, relation to plant fertilization, Hawaii [Sugar Planters'] 304.

in Vermont pasture soils, Vt. 15.

iodide and mercuric chloride, fungicidal efficiency, 631.

nitrate, effect on nodule formation and nitrogen fixation by clover, 459.

nitrate injection into a tree, results, 322.

nitrate manufacture, review of patents and literature, U.S.D.A. 165.

readily available in soils, determination, 295.

replaceable in orchard soils, effect of potassium-carrying fertilizers, 185.

Potato—

aphid, *Empusa aphidis* affecting, N.Y. State 654.

aphid, transmission experiments of potato yellow dwarf with, 640.

beetle, Colorado, notes, Idaho 74; Mont. 807.

blight, late, notes, 489.

diseases—

degenerative, breeding for resistance, Pa. 788.

notes, Fla. 346.

seed- and soil-borne, control, Iowa 787.

virus, belonging to mosaic group, 797.

virus, development and control, Utah 347.

virus, in 1933, 495.

Potato—Continued.

diseases—continued.

virus, natural transmission, [N.Y.] Cornell 788.

virus, new necrotic, 631.

virus, physiology, 205.

flea beetle, relation to scab, 64.

Fusarium wilt, relation to soil infection, Nebr. 788.

harvester development, Pa. 846.

insects, notes, N.Y. State 654.

leaf hopper—

control, new petroleum and pyrethrum spray for, Wis. 502.

induced immunity in plants to, 656.

injury to forage legumes, nature, 204, 631.

notes, Fla. 358.

leaf roll, new idea regarding, 797.

leaves, tip and margin burning, relative effects of leaf hoppers and bordeaux sprays, Ark. 787.

mosaic, latent, resistance to, 631.

mosaic, reduction by tuber indexing, Wis. 489.

plant, catalase in various parts, 167.

psyllid and psyllid yellows, control, Colo. 806.

psyllid, big-eyed bug predator, 812.

psyllid yellows, control, 225.

psyllid yellows, insect aspect, Utah 359.

psyllid yellows, studies, Utah 347.

Rhizoctonia scab and pitting, control, [N.Y.] Cornell 788.

rust spot disease, 797.

scab and *Rhizoctonia* control, N.J. 60.

scab, causal organisms, 640.

scab, control, 345.

scab damage, relation to soil conditions, Wis. 489.

scab fly, biology and morphology, 663.

scab, relation to environment and seed treatment, 630.

scab, relation to soil infection, Nebr. 788.

scab, varietal resistance, [N.Y.] Cornell 788.

stalk borer, survey, Iowa 806.

tuber injury, relation to digger operation, 704.

tuber rot caused by *Botrytis cinerea*, 630.

tuber worm, survey, Iowa 806.

tubers, glutathione and sulfate in, 593.

viruses, cooperative studies, Idaho 60.

yellow dwarf, 640; [N.Y.] Cornell 788;

Wis. 489.

Potatoes—

blackening during cooking, cause and prevention, Wis. 560.

breeding, Iowa 757; [N.Y.] Cornell 758.

clean and scabby, carbon dioxide formation, 65.

cost of production, 404.

Potatoes—Continued.

- crinkle and normal, carbohydrate metabolism, 205.
- culture and fertilizers, [N.Y.]Cornell 477.
- culture experiments, 35; Fla. 316; Idaho 35; Nebr. 758; S.C. 759; Wyo. 606.
- culture in Colorado, Colo. 177.
- culture in north Georgia, Ga. 765.
- culture in Pyrenees, 797.
- cut sets, effects of sulfur dusting, Fla. 316.
- effect of manganese sulfate, S.C. 759.
- effects of starch and mineral content. Colo. 757.
- experiments, [N.Y.]Cornell 758.
- experiments in Louisiana, 316.
- fall crop, growing, Ala. 323.
- fertilizer and cover crops tests, W.Va. 606.
- fertilizer experiments, 35; Ark. 756; Fla. 298, 316; Hawaii 316; Idaho 35; Ky. 35; P.R. 174; U.S.D.A. 448.
- fertilizer placement, 470.
- giant-hill and healthy tissues, comparison, 64.
- in ration of pigs, 677.
- in storage, Wyo. 719.
- inheritance of tuber color in, 168.
- late crop, growing in Oklahoma, 316.
- leaf roll infected and normal, carbohydrate metabolism, 205.
- mechanical diggers for reducing losses. U.S.D.A. 116.
- Netted Gem, as source of vitamin C. Idaho 137.
- new, storage, 41.
- nutritional conditions for stolon and tuber development, Nebr. 758.
- of Czechoslovakia, vitamin C in, 569.
- of South America, breeding possibilities, 40.
- on Long Island, insects attacking. [N.Y.]Cornell 807.
- photoperiodism experiment, Fla. 316.
- prices and index numbers, Mich. 124.
- prime, minimum weight, 470.
- production with tractor power, 704.
- root habits in humid soils of New Jersey, 36.
- rotation experiments, U.S.D.A. 759.
- Sclerotium* rot of, Ark. 787.
- seed, certified, production, economics of, Vt. 120.
- seed, chilled, yield results from, 765.
- seed, electrical measurement of degree of degeneration, 798.
- seed, handling, Ohio 765.
- seed, in New Zealand, test, 206.
- seed maintenance studies, Md. 40.
- seed piece decay, Fla. 347.
- seed testing for freedom from virus diseases, Fla. 347.
- seed treatment, Wyo. 606, 635.
- seed treatment with yellow oxide of mercury, N.Y.State 635.

Potatoes—Continued.

- shortening rest period, U.S.D.A. 41.
 - situation, 855.
 - size of seed piece, effect on recovery from freeze injury, La. 322.
 - soil amendments, Fla. 316.
 - sound and degenerated, copper test for, 640.
 - spraying, 798; Conn.[New Haven] 429.
 - spraying, effect of pressure and amounts of copper, 631.
 - spraying efficiency, [N.Y.]Cornell 788.
 - spraying experiments, Md. 40.
 - spraying with bordeaux, copper-lime ratio, 630.
 - spraying with bordeaux mixture, N.J. 60.
 - storage, U.S.D.A. 699.
 - strain tests, Nebr. 758.
 - studies, Ohio 40.
 - suggestions for autumn crop, La. 41.
 - tubers, propagation value, effect of storage temperature, [N.Y.]Cornell 322.
 - varieties, cold resistant, 321.
 - varieties, quality, U.S.D.A. 560.
 - variety tests, Fla. 316; Hawaii 316; Iowa 757; Ky. 47; Nebr. 758; U.S.D.A. 759; Utah 316; Wyo. 606.
 - veinbanding virus, rate of spread, 633.
 - vitality determination in, 353.
- Potosia affinis*, notes, 653.
- Poultry—see also Chickens, Chicks, Ducks, Fowls, Hens, etc.
- body weight, egg weight, and age at sexual maturity, interrelation, 678.
 - breeding, Iowa 755.
 - breeding and feeding, U.S.D.A. 514.
 - breeding, low-producing strain, 171.
 - breeding, standards for, N.J. 91.
 - breeding stock, selection, N.J. 88.
 - breeds, crosses, variation and heredity of characters, 603.
 - brooding, electric, heat requirements. N.H. 546.
 - brooding, warm- and cold-room, use of electric canopy hover in, [N.Y.] Cornell 823.
 - crooked breast bones in, cause, N.J. 88; Wis. 515.
 - diseases, 102, 536.
 - diseases and parasites, Nebr. 843.
 - diseases in Greece, 258.
 - effect of fasting, Mo. 515.
 - effect of feeding vitamin D supplements, Ky. 88.
 - farming, commercial, 374.
 - farms, commercial, replacement costs, 266.
 - farms in Bristol Province, capital requirements, 266.
 - feeding experiments, Pa. 823; S.C. 823; Utah 371.
 - feeding, housing, and lighting experiments, Wyo. 374.

Poultry—Continued.

- feeding, sources of calcium for, S.Dak. 92.
 feeding, value of corn gluten meal for, [N.Y.]Cornell 823.
 feeding, value of minerals and proteins in, La. 91.
 feeding, vitamin G and iodine supplements, Calif. 671.
 fertility studies, 173, 240.
 flocks, numbers of young chickens in, effect of feed-egg ratio, 854.
 flocks, Ohio Record of Performance, production, 241.
 growth, relation to feed consumption, correction, 520.
 head type, and egg production and weight, correlation, [N.Y.]Cornell 823.
 house, multiple unit laying, plans and construction, N.J. 117.
 houses, disinfection with fire gun, 845.
 houses, lighting with gasoline lantern, Wyo. 671.
 houses, ventilation, [N.Y.]Cornell 846.
 housing experiments, S.C. 823.
 improvement, U.S.D.A. 671.
 industry, relation to parasitism, 697.
 inheritance of abnormal anatomical condition in tibial metatarsal joints, 171.
 inheritance of sexual maturity, rate, and persistence of laying, 678.
 laying houses, ventilation requirements, N.J. 110.
 linkage tests in, 32.
 management, W.Va. 671.
 management, recent modifications in, 266.
 meat production, cost reduction, U.S. D.A. 87.
 mortality problem, 390.
 nutrition research, method for anatomical studies, 828.
 parasites of, U.S.D.A. 528.
 Producers' Association, Hayward, operations, Calif. 405.
 production, textbook, 275.
 products, index numbers, Mich. 124.
 progeny testing of males, value, W.Va. 671.
 Rhode Island Red, effects of inbreeding, Mass. 519.
 situation, Okla. 707.
 statistics of southern California, Calif. 410.
 toxicity of *Crotalaria* seed for, 391.
 vermifuges, efficacy and effect on egg production, Fla. 371.
 vermifuges, relative efficiency, Ark. 845.
 vitamin D requirements, Pa. 373; Wash. 92.
 White Leghorn, high- and low-hatching lines, [N.Y.]Cornell 823.
 Poults, calcium-phosphorus ratio, modifying, Nebr. 822.
 Power machines, efficiency of use, 113.

Power-shovel operation in road grading, U.S.D.A. 262.

Prairie—

- in western North Dakota, botanical analysis, methods, 759.
 types, vegetation in, 318.
 Precipitation—see also Rainfall, Snow, etc.
 and temperature map of United States, 160.
 trends east of Rocky Mountains, 297.
 Pregnancy—
 diagnosing in sheep and goats, 465.
 diagnosis, use of clawed toad for, 172.
 disease of ewes, Mo. 840.
 effect on the ovary, 313.
 effect on titre of immune antibodies in rabbit, 313.
 nitrogen economy during, 721.
 Preisz-Nocard bacilli in soils from sheep camping grounds, 105.

Prices—

- August 1934, for various Ohio farm products, Ohio 547.
 fluctuations and trading in futures, 716.
 fluctuations, effect on consumer demand, 266.
 paid by farmers, index data, U.S.D.A. 118.

Prinomitus mitratus, notes, 225.

Pristomerus new genus, description, 820.

Proctotarinia matteiana, notes, 656.

Proctacanthella new genus, erection, 229.

Prodenia litura in Egypt, 661.

Progestin injections, effect on mammary development, [N.Y.]Cornell 756.

Prolan and hypophyseal substance combined, gonadotropic effects, 605.

Prolan and prol-an-like substances, recognition and comparison, 604.

Promachina new genus, erection, 229.

Propionibacterium shermanii, notes, 686.

Propionic acid bacteria, mechanism of glucose dissimilation, 440.

Prosthogonimus macrorchis—

n.sp., description, 392.

taxonomy, morphology, and biology, Minn. 392.

Protein—

- diets, high, with vitamin supplements, effect on growth of rats, 419.
 factor in nutrition, 413.
 solutions, determination of membrane potentials and valence of protein ions, 443.
 solutions, effect of irradiation and heat, 581.
 synthesis in pea plant, factors affecting, 750.
 Proteinase, enzymatically pure, preparation, 294.
 Proteins—
 and amino acids, combinations, 291.
 blood, determination by acid acetone, 11.
 effect of halides of sodium and rubidium, N.Y.State 581.

Proteins—Continued.

- nitrogen in, 5.
- of cowpeas and sugar beets, effect of potassium, 165.
- of grasses, cystine in, 581.
- of hay, digestibility, U.S.D.A. 516.
- of yeast, U.S.D.A. 436.
- supplementary value, determination by paired-feeding method, 372.
- titration with trichloroacetic acid, 581.
- tryptic digestion, 582.
- vegetable, in laying and breeding rations, S.C. 823.

Proteus vulgaris, use in sugar analysis, 157.

Protoplasm—

- electric charge of colloid particles, 292.
- structure, 749.

Protozoa—

- of moorland soils of Lombardy, 29.
- soil, studies, 453.
- sterilization, 382.

Prunes—

- alternate-bearing sugar, phosphorus in, 481.
- California, iron, copper, and manganese in, 868.
- dried, carbohydrates of, 623.
- drying, problems of, Calif. 719.
- new rust mite pest, Idaho 74.
- production in western Oregon, cost and efficiency, Oreg. 404.
- survey in Romanic Switzerland, 623.

Prunus—

- bacterial canker in California, 632.
- mume* flowers, nature of doubling in, 339.

Psallus seriatus, see Cotton flea hopper.

Pseudococcus—

- adonidum*, see Mealybug, long-tailed.
- brevipes*, see Mealybug, pineapple.
- citri*, see Mealybug, citrus.
- gahani*, reproduction in, 225.

Pseudomonas—

- carotae* n.sp., description, 496.
- cerasi*, variability on solid media, 355.
- citri*, see Citrus canker.
- radicicola*, see Nodule bacteria.
- spp., studies, [N.Y.]Cornell 196.

Pseudopregnancy, production by mechanical stimulation of nipples, 465.

Pseudorabies, see Paralysis, infectious bulbar.

Psilostomum ondatrae, notes, 537.

Psoriasis, new pathogenesis and therapy for, 571.

Psorosticha zizyphi, studies, 662.

Psychology, applications to industry, 243.

Psyllidae, insect parasites, 225.

Puccinia—see also Rusts and host plants.

- glumarum* in United States, physiologic specialization, 62.
- graminis*, antiquity in California, 635.
- graminis tritici*, physiologic forms, distribution, 632.
- graminis*, white pycnia and aecia, 638.
- spp., germination of urediniospores, effect of humidity, 199.

Puerto Rico Insular Station, report, 286.

Pullets—see also Fowls and Poultry.

- body weight, production, and egg weight, interrelation, 239.
- early hatched, management, N.J. 241.
- effect of rye on egg production, Wis. 515.
- feeding grain to, methods, W.Va. 671.
- growth rate, Mo. 514.
- laying, shields for preventing cannibalism in, Mich. 521.
- mineral metabolism, 678.
- time interval from first egg to stand-ard egg weight, Mass. 521.

Pulleys and belts on the farm, 115.

Pullorum disease—see also *Salmonella pullorum*.

- agglutination tests, comparison, 260, 537; Ky. 102.
- diagnosis, stained antigen for, U.S. D.A. 528.
- diagnostic value of various tests, 260.
- effect of brooding temperatures, 261.
- eradication in Massachusetts, Mass. 538.
- in Greece, 258.
- in Hungary, Government combat, 538.
- studies, 537; Calif. 689; Idaho 102; Mo. 528.
- whole blood stained antigen test, doubtful reactors to, 391.

Pulse rate, effect of coffee caffeine and de-caffeniated coffee, 873.

Pumping, drainage and irrigation, efficiency, Idaho 110.

Pumpkins—

- bush, sex ratios and fruit production, 772.
- variety, relation to character of canned product, N.Y.State 617.

Pumps, centrifugal, turbines, and propellers, 264.

Purple mite, lime-sulfur as control, Fla. 358.

Purple scale on young grapefruit and orange trees, 655.

Pyralis farinalis, see Meal moth.

Pyrausta nubilalis, see Corn borer, European.

Pyrenophora, phytopathological and taxonomic aspects, 635.

Pyrethrum—

- action on forest pests, 217.
- and derris, difference in action against imported cabbage worm, 358.
- as insecticide, status, 809.
- crown rot and damping-off, control, Colo. 787.
- dusts exposed to air and light, loss of toxicity, 809, 810.
- extract for control of *Antestia* on coffee, 811.
- flower dust, collecting hydrophids with, 357.
- insect powder, aqueous suspensions, size of particles, 216.

Pyrethrum—Continued.

- oil sprays for grape leaf hoppers, Calif. 654.
- use on cabbage and cauliflower, Colo. 806.

Pyridine, penetration into bodies of insects, 656.

Pythium—

- arrhenomanes*, variability on corn and sugarcane, 63.
- debaryanum*, notes, Mo. 488.
- graminicolum* root rot, predisposing factors in, 798.
- oospore production, humus extract agar for, 349.
- sp., notes, Colo. 787.
- ultimum*, notes, 352; S.C. 789.

Quackgrass, control, Wyo. 606.

Quail—

- bobwhite, ecology, Iowa 804.
- bobwhite, parasitism, relation to diet, 110.
- eggs, temperature requirements and humidity for incubation, [N.Y.]Cornell 651.
- toxicity of *Crotalaria* seed for, 391.

Quince fire blight, control in the bloom, [N.Y.]Cornell 788.

Quinces—

- pollination, effect of spraying during bloom, 187.
- stooled, winter injury to stocks, N.Y. State 774.
- varieties, new in Russia, 773.

Rabbit—

- carcasses, weight loss and chemical composition, 828.
- pox, manifestations and course of disease, 257.

Rabbits—

- breeding and reproduction in, 313.
- feeding and management, U.S.D.A. 522.
- gestation period, hereditary variations in, 171.
- infantile, effects of follicle-stimulating and luteinizing pituitary extracts on ovaries, 313.
- infertile, treatment with autuitrin S, 465.
- nutritional requirements, Mo. 515, 522.
- of central Oklahoma, parasites, 393.
- physiology of cold blackening in, 756.
- production, U.S.D.A. 375.
- raising, profits, effect of age at marketing U.S.D.A. 87.
- wild, flatworm and roundworm parasites, 699.

Rabies in Nevada, history, 697.

Radishes—

- New York market prices, N.J. 124.
- oriental, vitamin B₁ in, Hawaii 413.
- Scarlet Globe, shape, relation to planting depth, 330.

Radium emanations from soil, fixation by plants, 589.

Ragi, anthesis and pollination in, 178.

Railletina—

- echinobothrida*, notes, 257.
- spp. in fowls of Kansas, 257.

Raincoat fabrics, durability, elasticity, and resistance to water, tests, 424.

Rainfall—see also Precipitation.

- and forests, 12.
- and hemlock growth in New Hampshire, 785.
- and soil properties, functional relation, 451.

- effect on sugar beet heart rot, 641.
- new measures for crop production, 315.
- of China and world weather, 159.
- penetration through forest canopy, 297.

Raisin moth—

- field trapping, 365.
- host materials, 365.

Rams, Corriedale, value for crossing on native ewes, W.Va. 671.

Rancidity—

- in foods, light factor in, U.S.D.A. 7.
- problem and new developments regarding, effect of light, 867.

Range—

- grasses, see Grasses.
- improvement experiments, Colo. 757.
- insects, control by lizards, 357.
- plants, poisonous, see Plants, poisonous.
- Livestock poisoning, and specific plants.
- reseeding experiments, Utah 317.

Rape—

- seeds, weight for 1,000, Md. 45.
- v. turnip pasture for swine, Ark. 821.

Raspberries—

- and other *Rubus* species, Hawaii 327.
- black, fruiting habit, 190.
- black, hybridization, Iowa 769.
- black, mosaic control, N.Y.State 635.
- black, mosaic klenidusity, testing for, N.Y.State 635.
- black, propagation, Iowa 769.
- culture, Ohio 47.
- culture and disease control, Ill. 778.
- culture, harvesting, and marketing, N.Y.State 624.
- culture in Michigan, Mich. 482.
- fertilization studies, 341.
- fruit bud formation, 190.
- insects affecting, N.Y.State 654.
- Latham, response to pruning, Minn. 623.
- propagation, N.Y.State 774.
- propagation by leaf bud cuttings, 341; N.Y.State 617.
- root and shoot forming habits, 190.
- soil management, N.J. 47.
- spraying, Ky. 47.
- winter injury, Pa. 769.
- winter injury of 1933-34, N.Y.State 333.

Raspberry—

- anthracnose, control, N.Y.State 635.
- bacterial twig and blossom blight, 631.
- cane measurements, 340.
- diseases, control, Ky. 47.

Raspberry—Continued.

- diseases, pruning and spraying experiments, Ky. 60.
- foliage, effect of bordeaux mixture and lime-sulfur, Ky. 47.
- fruitworm, studies, U.S.D.A. 653.
- mosaic, mild, in Columbian purple variety, N.Y.State 635.

Rat—

- baits, canned, use, U.S.D.A. 72.
- flea, oriental, in interior of United States, 664.
- flea survey of Ceylon, 510.
- flea survey of Los Angeles Harbor, 816.
- typhus, gray rats as carriers of bacilli, 690.

Rats—see also Rodents.

- bone development and body growth, effect of sodium fluoride, 726.
- developing, experiments on, 464.
- dietary depigmentation, 284.
- endogenous nitrogen metabolism in, Mo. 515.

- heat production, Pa. 823.
- prevalence and control, Fla. 358.

Real estate—see also Farm real estate.

- values, pattern less changed than level of values, U.S.D.A. 118.

Red mite, European, in New Zealand, 370.
Red mites on raspberries, control, N.Y.State 654.

Red scale, California—

- biology, 225.
- fumigation experiments, 363.
- fumigation for, effect of temperature and humidity, 225, 363.
- fungus enemy, 660.
- in Palestine, 660.
- on lemons, spray-fumigation treatment, Calif. 226.

Red spider—

- citrus, method of dissemination, 514.
- life history, habits, and control, N.J. 513.
- natural enemy of, 817.
- on raspberries, N.Y.State 654.
- tests of insecticides for, 504.

Red squill for destruction of rats, P.R. 216.

Red weevil, control, 808.

Redtop—

- infusions, forms of nitrogen in, 150.
- seeds, weight for 1,000, Md. 45.

Reed canary grass—

- culture experiments, Iowa 757.
- seed, development of header for harvesting, Wis. 539.

Refrigeration—

- dairy, studies, Mo. 539.
- theory, appliances, and applications, bibliography, 400.

Regional planning, analytical basis for, 853.

Reindeer, biology and husbandry in Malaya Zemlya tundra, 651.

Relapsing fever in Texas, transmission, 250.

Rennin coagulation, nature of clot, 524.

Reproduction—

- and diet, 423.
- in rabbits, physiology, 313.
- in sheep, physiology, Mo. 464.

Research, see Agricultural research.

Resistenes, use of term, U.S.D.A. 634.

Reticulitermes hesperus in California, Calif. 506.*Rhabdophaga heterobia*, notes, 814.*Rhagoletis*—

- cingulata*, see Cherry fruit fly and Cherry maggot.

- fausta*, see Cherry fruit fly, black.

- juglandis*, see Walnut husk fly.

- pomonella*, see Apple maggot.

Rhinophora lepida, notes, 229.*Rhizobium*—

- japonicum* and *R. meliloti*, growth rates, comparison, 28.

- meliloti* and *R. japonicum*, growth rates, comparison, 28.

- meliloti*, studies, Iowa 743.

- spp. in clay soil, relative numbers, 302.

- spp., oxygen consumption, effect of nitrogen source, 164.

- spp., relation to nodule formation on Florida legumes, 28.

Rhizocaline, chemical nature, 597.

Rhizocaline, test method for, 597.

Rhizoctonia—

- damping-off, biological control, 633.

- disease of sugar beet, symptoms, 789.

- parasitic activity of *Trichoderma* against, 790.

- solani*, distinct strains on sugar beets, 206.

- solani*, fungi parasitic on, 632.

- solani*, notes, Ga. 801; U.S.D.A. 195.

- solani* on lettuce, [N.Y.]Cornell 208.

- zeae* n.sp. on corn in Florida, 794.

Rhizoglyphus hyacinthi, see Bulb mite.*Rhizopertha dominica*, notes, 75.*Rhizopus nigricans*—

- hetero-auxin isolation from, 597.
- notes, 352.

Rhododendron diseases, N.J. 60.

Rhodoneura terminalis, notes, 75.*Rhombodera tectifformis*, biology, 658.

Rhubarb—

- New York market prices, N.J. 124.

- stem spot, 351.

- varieties, N.J. 47.

Rhyacionia buoliana, see Pine shoot moth, European.*Rhynchaenus mangiferae*, life history notes, 666.*Ribes*, seasonal development, relation to spread of blister rust, 71.

Rice—

- artificially induced mutations and polyploid plants, 752.

- bakanae* disease, studies, 200.

- blast disease, development, effect of soil temperature, 201.

- blast disease, inoculation experiments, 202.

Rice—Continued.

- blast disease, relation to atmospheric humidity, 202.
- blast fungus, physiologic specialization in, 201.
- blooming, studies, 765.
- breeding, Ark. 756; Calif. 606; U.S.D.A. 605.
- byproducts, feeding value for hens, Ark. 821.
- color development in glumes and apiculus, 611.
- cultivated, botanical classification, 42.
- culture experiments, Ark. 756.
- culture in Imperial Valley, Calif. 34.
- disease caused by *Gibberella saubinetii*, 201.
- effect of nitrogen forms on growth and nitrogen content, 761.
- embryos, sterols of, 732.
- fertilizer experiments, Ark. 756; Calif. 606.
- grown in various localities, quality, U.S.D.A. 560.
- haploid plant in, 461.
- infection by *Hypochnus sasakii*, factors affecting, 203.
- inheritance of albino and white-striped characters, 169.
- lodging of straw and its inheritance, 765.
- milling technic, improvement, U.S.D.A. 605.
- nematodes attacking, 491.
- nutrition, Ark. 743.
- of Kwangtung, wild, and new hybrids from, 323.
- pests, control, 808.
- polish, feeding value and effect on swine, Ark. 821.
- polishings, vitamins B and G in, 138.
- Rexoro, sunscald of panicles, 641.
- seedling blight in Arkansas, 345.
- seedling blights, reduction by seed treatments, Ark. 787.
- smut, notes, Ark. 787.
- stem borers, biological control in Malaya, 820.
- stem rot in California, 641.
- stem rot, notes, Ark. 787.
- stored, insects affecting in Louisiana, control, 75.
- straighthead, effects of rice straw and irrigation methods, Ark. 787.
- types of Bihar and Orissa, classification, 611.
- variety tests, Ark. 756.
- vitamin B₁ in, determinations, using ricebirds and rats, 282.
- water weevil, studies, Ark. 806.
- weeds, control, Ark. 756.
- weevil, biological studies, 217.
- weevil in corn, S.C. 807.
- weevil in stored rice, control, 75.
- weevil, relative efficiency of fumigants, 77.

Rice—Continued.

- wild, sterile flower, 323.
- yields following certain crops, Ark. 757.
- Rickets—
 - and cereals, 571.
 - in chicks, preventives, Iowa 822.
 - in chicks, relation to preen gland, Wis. 515.
- Rinderpest—
 - antiserum, immune and hyperimmune, merits, 386.
 - control, 382.
 - in sheep, artificial infection, 534.
 - studies, 250.
 - vaccine, Nigerian method of making, 530.
 - virus, electric charge, 103.
- Ring spot, intracellular bodies in, 632.
- Ringworm in cats, U.S.D.A. 528.
- Road—
 - oils in aggregates, evaporation, Colo. 846.
 - surfaces, relation to tractive resistance, 850.
- Roads—
 - concrete, *see* Concrete.
 - construction, U.S.D.A. 735.
 - construction, Federal legislation and regulations relating to, U.S.D.A. 542.
 - grading, power-shovel operation in, U.S.D.A. 112, 262.
 - of Indiana, State and county, traffic on, U.S.D.A. 702.
 - oil-treated, in Colorado and Wyoming, U.S.D.A. 112.
- Robber flies of Texas, 229.
- Robinia pseudacacia* brooming disease, transmitted by grafts, 630.
- Rock phosphate, *see* Phosphate.
- Rodents—*see also* Mice and Rats.
 - control, effect of foxes, U.S.D.A. 500.
 - control with sodium fluosilicate, 653.
 - of Colorado, control, 358.
- Roentgen rays, *see* X-rays.
- Rooks, popular account, 500.
- Root—
 - borers, notes, 655.
 - crops as grain substitute for dairy cows, Wyo. 680.
 - formation, effect of rhizocaline, 597.
 - forming hormone, chemical nature, 597.
 - growth in field, method of observing, 334.
 - knout nematode—
 - environmental relations, 650.
 - in greenhouses, control, 630.
 - in Philippines, 212.
 - of potatoes, N.Y.State 635.
 - on *Mimosa* and tobacco, effect of sulfur, 207.
 - on peas, U.S.D.A. 640.
 - on peppers, Ga. 801.
 - on rice, 491.
 - resistance in cowpeas, breeding for, 632.

Root—Continued.

- knot nematode—continued.
 - resistance of fruit rootstocks to, Calif. 634.
 - trap crops, studies, 70.
- nodule bacteria, effect of fertile non-acid soils, Wis. 448.
- stocks, vegetative propagation, N.Y.State 617.
- weevils affecting conifers, N.Y.State 654.

Roots, studies, 334.

Rose—

- and lavender perfume production, U.S.D.A. 616.
- anthracnose in Oregon, U.S.D.A. 195.
- beetle, Fuller's, in Australia, 656.
- black spot and brown canker, control, N.J. 60.
- buds, dormant, transplanting, N.Y.State 617.
- canker, notes, U.S.D.A. 195.
- Coniothyrium* of, symptoms, 789.
- leaf beetle, notes, N.Y.State 654.
- mosaic, resistance to, N.J. 60.

Roses—

- blind wood in, causes, 55.
- chlorosis of, 637.
- climbing, 192.
- cutting back after planting, N.Y.State 774.
- greenhouse, culture, N.J. 47.
- sterility in, causes, 783.
- summer-budded, forcing qualities, effects of prolonged storage, Ill. 783.
- Talisman, effect of mosaic on bloom production, 648.

Resin and turpentine, U.S.D.A. 436.

- Rotation of crops, 35, 36; Ark. 756; Idaho 35; Ky. 13; Utah 317; Wyo. 606.
- under irrigation, Nebr. 758.
- use of manure and fertilizers, Md. 13.
- using winter legumes, Fla. 316.

Rotenone—

- bearing plants, studies, U.S.D.A. 653.
- derivatives, toxicity, U.S.D.A. 502.
- dust for cabbage worms, Wis. 502.
- from devil's-shoestrings, U.S.D.A. 504.
- use on cabbage and cauliflower, Colo. 806.

Roughages—

- and concentrates for maintaining high vitamin A value of butterfat, 523.
- processing for wintering stock calves, Mo. 514.

Rubber-producing plants, culture experiments, U.S.D.A. 616.

Rubber production, world, 194.

Ruminants—

- nutritive value of proteins for, [N.Y.] Cornell 823.
- parasites of, U.S.D.A. 528.

Rural—

- appraisers, standards of practice for, 713.
- community development in Waterville, New York, [N.Y.]Cornell 129.

Rural—Continued.

- credit, *see* Agricultural credit.
- education in Illinois, 275.
- housing survey, Utah 428.
- life and culture in United States, effect of recent and pending developments, 853.
- neighborhoods, trends of, Wis. 717.
- nonfarm families, agricultural activities, Ohio 547.
- organization contacts in Kentucky communities, Ky. 129.
- population, mobility in Connecticut, [Conn.]Storrs 412.
- schools, *see* Schools, rural.
- social and economic areas in central New York, [N.Y.]Cornell 717.
- social organization in south-central Arkansas, Ark. 864.
- standards of living, *see* Standard.
- young people, status and activities, 718.

Rust mite—

- lime-sulfur as control, Fla. 358.
- notes, 653.

Rusts—*see also specific hosts.*

- in Pennsylvania, 790.
- in United States and Canada, manual, 57.
- of *Solanum*, microcyclic species, 790.
- of wheat, rye, and grasses, hybridizing, U.S.D.A. 633.
- relation to hosts, 638.

Rutabagas, *see* Swedes.

Rye—

- and *Aegilops*, hybrids, seed setting, morphology, and fertility, 752.
- as pasture crop, 319.
- breeding, N.J. 35.
- certified seed production, rules and requirements for, N.J. 616.
- culture, importance of phenological observations, 740.
- diseases in Arizona, key, Ariz. 346.
- effect on egg production of pullets, Wis. 515.
- feeding value for chicks, Wyo. 374.
- fertilizer experiments, Fla. 316.
- flour as pollen substitute, Wis. 502.
- flour, testing, 568.
- grains, fermented, residue, 138.
- green, for fattening hogs, S.C. 823.
- prices and index numbers, Mich. 124.
- proteins, vitamins, and germ, nutritive properties, 88.
- varieties, milling and baking properties, 178.
- variety tests, Ark. 756; Fla. 316; Ga.Coastal Plain 757; Ind. 35; N.J. 35.
- yields, Ind. 35.

Saccharomyces ellipsoideus, thermal death point, 6.

Safflower as source of drying oil, U.S.D.A. 616.

Sahuaro crown gall, 631.

Saissetia oleae, *see* Black scale.

- Salad dressing, spoilage, N.Y.State 581.
- Salmon—
liver and salmon egg oils, vitamins in and properties, 880.
parasites, Oreg. 73.
poisoning fluke, Oreg. 73.
- Salmonella*—
classification of genus, 534.
enteritidis of mice in Victoria, 103.
gallinarum and *S. pullorum*, differentiation, 698.
infection of foxes and dogs, 250.
pullorum—see also *Pullorum* disease.
and *S. gallinarum*, differentiation, 698.
infection experiments with swine, 388.
schottmülleri, pleomorphism, 102.
sp., role in paratyphoid of canaries, 845.
spp., role in fowl paralysis and leucosis, 844.
suipestifer, role in enteric disease independent of hog cholera virus, 389.
- Salt—
effect on Cheddar cheese quality, 685.
levels for poultry, Wis. 515.
- San Jose scale—
and *Mineola* moth, combination spray for, Idaho, 74.
control, 345.
control with oil emulsion, Idaho 74.
creosote oil for, 78.
menace to European fruit culture, 363.
- Sand, bleached, and hardpan as products of opposite kinds of climate, 297.
- Sand flies—
control, 689.
saltmarsh, in Georgia, U.S.D.A. 652.
- Sandal spike disease, studies, 359, 803.
- Sands, Kazakstan, microflora, 453.
- Sandy soils—
absorptive capacity and velocity of percolation, 261.
Hancock Substation field experiments, Wis. 448.
management, Mich. 161.
- Sanitary situation in 1933, 102.
- Sanitation, rural, relation to commodity production, 546.
- Sarcocystis tenella*, injury to sheep, Wyo. 689.
- Sarcoma, Rous, in fowls, immunity, 538.
- Sarcophaga caridei*, parasite of migratory grasshopper, 658.
- Sardine oil v. cod-liver oil as source of vitamin A, Idaho 88.
- Sauerkraut—
juice, effect of light, 133.
studies, N.Y.State 581.
- Sawflies, head capsule, statistical studies, 217.
- Scab gnats, relation to potato tuber defects, [N.Y.]Cornell 807.
- Scabies, eradication, U.S.D.A. 528.
- Scale insects—
in California citrus orchards, double treatment, 362.
lime-sulfur as control, Fla. 358.
methyl thiocyanate fumigation of, U.S.D.A. 502.
on young grapefruit and orange trees, 655.
- Scallions, New York market prices, N.J. 124.
- Scarabaeid grubs, back-crawling, notes, 653.
- Scarabaeidae collected at Clemson College, list, 665.
- Schistocerca*—
gregaria, notes, 811.
paranensis, important parasites of, 658.
- Schools—
agricultural, see Agricultural education.
Arkansas public, financial situation, Ark. 863.
rural, operating costs, Iowa 863.
- Scirtothrips citri*, see Citrus thrips.
- Scirtothrips signipennis*, control, 222.
- Sclerotinia*—
americana conidia, relation to form of toxicity surface for copper sulfate and sulfur, 631.
cinerea, notes, 645.
libertiana, notes, N.J. 60.
on Chinese elm seedlings, control, Colo. 787.
sclerotiorum, notes, Colo. 787.
sp. on roots of alfalfa and sweetclover, 796.
- Sclerotium*—
delphinii, studies, Mo. 488.
fungus, undescribed, in northeast Texas, 631.
gladioli, perfect stage, 630.
oryzae, ascigerous stage, 632.
rhizodes, notes, 630.
rolfsii, basidial stage, 632.
rolfsii, fungicidal effect of some compounds, 349.
rolfsii in sugar beet fields, quantitative determination, 632.
rolfsii, notes, 210; Calif. 634; Ga. 801.
rot of plants, Ark. 787.
- Scolia manilae*, parasite of Asiatic beetle, Hawaii 817.
- Scolytus*—
multistriatus, notes, 803; U.S.D.A. 653.
multistriatus, vector of Dutch elm disease, 819.
spp., scouting for, 74.
- Scorbutic diet No. 3 from rolled oats and dried milk, 887.
- Screw threads, strength under repeated tension, 112.
- Screwworm fly, destructive outbreak, 688.
- Screwworms—
control, fly trapping aids, U.S.D.A. 74.
of livestock in Georgia and Florida, control, U.S.D.A. 652.
- Scrotum, thermo-regulatory mechanism and effect on spermatogenesis, Mo. 463.

Scurvy—

- diagnosis, reliability of capillary resistance test, 568.
- experimental, and Bezssonoff reaction, 423.

Sea water, lethal effect on Mediterranean fruit fly, 366.

Secodella pallidiscapus, notes, 370.

Seed—

- law of Kentucky, Ky. 474.
- scarifier, home-made, U.S.D.A. 706.
- scarifiers and cleaners for, U.S.D.A. 699.

Seedbeds, preparation, methods, Wyo. 606.

Seed-corn maggot—

- parasite of migratory grasshopper, 658.
- puparia, survival of bacteria in, 217.
- studies, 366.

Seedlings, sand culture v. soil culture, 593.

Seeds—

- certified, production, rules and requirements for, N.J. 616.
- damping-off, effect of weather, N.Y. State 635.
- decay, effect of weather, N.Y. State 635.
- effect of high moisture and warmth, U.S.D.A. 34.
- effect of high temperatures, 593.
- germinating, protection from soil-borne organisms, importance, N.Y. State 635.
- germination, U.S.D.A. 596.
- germination and longevity tests, 181.
- germination, effect of ultraviolet radiation, 308.
- germination, response to temperature, moisture, and light, N.Y. State 597.
- oil, *see* Oil seeds.
- purity and germination guaranties, Vt. 474.
- root rot, effect of weather, N.Y. State 635.
- storage tests, Fla. 316; Nebr. 758.
- testing for viability and purity, N.Y. State 617.
- tolerance of liquid-air temperatures, 48.
- treatment, 346; Ariz. 346; Fla. 347.
- vegetable, testing for seed-borne diseases, N.Y. State 635.
- weed, *see* Weed seeds.
- weight for 1000, Md. 45.

Seguidilla tests, P.R. 174.

Selenium—

- bearing plants, poisonous to livestock, 251.
- compounds, relation to alkali disease, U.S.D.A. 690.
- concentrations, effect on wheat, 203.
- storage in the body, U.S.D.A. 560.

Septicemia, hemorrhagic—

- bovine, transmission experiments, 386.
- etiology and prophylaxis, 102.

Septoria—

- acicola*, notes, 803.
- azaleae*, control, N.J. 60.

Septoria—Continued.

- menthae*, notes, 210.
- on poplar, symptoms, 789.
- pisi*, notes, U.S.D.A. 640.

Sericothrips variabilis on cotton seedlings, 77.

Serine, synthesis, 437.

Serums—*see also* Blood.

- standardization, 102.

Sesame—

- diseases in Arizona, key, Ariz. 346.
- seeds, calcium in, utilization, U.S.D.A. 560.
- seeds, nutritive value, U.S.D.A. 133.

Sesbania diseases in Arizona, key, Ariz. 346.

Setaria labiata-papillosa in blood of cattle, 532.

Sewage—*see also* Sludge.

- and cellulosic waste, fuel from, 706.
- chlorination, N.J. 110.
- mechanical aeration, 400.

Sex—

- characters, secondary, in English sparrow, control, 605.
- control in haploid males, 312.
- determination test of Dorn and Sugarman, results, 605.
- hormones, injections into immature guinea pig, uterine reaction to, 604.

Shallu, phosphorus availability and assimilation, Fla. 347.

Sheep—*see also* Ewes and Lambs.

- Australian Merinos in Wyoming, Wyo. 671.
- blowfly, notes, 218.
- botfly—*see* Botfly, sheep.
- branding fluids, comparison, Calif. 671.
- crossbreeding experiments, U.S.D.A. 500.
- crossbreeding for lambs of best quality, Calif. 671; Wyo. 671.
- cyanide poisoning, treatment, 253.
- diseases, 837.
- diseases of economic importance in South Australia, 534.
- drenched with carbon tetrachloride, effect on appetite, 529.
- farming in 1932-33, profitability, 266.
- farming in the Cotswolds, 855.
- feeding, breeding, and management, U.S.D.A. 514.
- feeding experiments, 675.
- fine-wool, production, W.Va. 671.
- fleeces, ram and ewe, comparison, Calif. 671.
- improvement, U.S.D.A. 671.
- maggot flies in Scotland, 367.
- management, N.J. 90.
- pastures, types, U.S.D.A. 826.
- poisoning, *see* Livestock poisoning.
- Plants, poisonous, and specific plants.
- pregnancy disease in, Mo. 840.
- prices and index numbers, Mich. 124.

Sheep—Continued.

- production on the range, costs and methods, Colo. 854.
- pulpy kidney disease in Palestine, 694.
- Rambouillet, B and C types of fleeces, value, Utah 371.
- ranching in western Canada, 861.
- tapeworm in California, 388.
- weather stain and blowfly strike in New South Wales, 229.
- wintering on desert ranges, supplements for, Utah 371.
- wool production, effect of rations, Okla. 517.
- worms, estimating number in fourth stomach and small intestine, 103.

Shellfish of New Jersey waters adjacent to salt marshes, habits, 229.

Shrubs—

ornamental—

- care and pruning, Ala. 343.
- protection from Japanese beetle, U.S.D.A. 81.
- tests on dry and irrigated land, U.S.D.A. 770.

vegetative propagation, 53.

Silage—

- A. I. V., studies, 516.
- corn, feeding value, Idaho 825.
- corn, protein in, effect of nitrogen fertilization, N.J. 95.
- corn, studies, W.Va. 671.
- corn, with cottonseed meal, feeding value, S.C. 831.
- grass, studies, U.S.D.A. 525.
- marrow stem kale and turnip tops, composition and digestibility, 832.
- oat and pea stack, digestibility and feeding value, 524.

Silicic acid, biochemistry, 151.

Silk, weighted, deterioration, Iowa 893.

Silkworm jaundice, relation of virus and inclusion bodies, 227.

Silos—

- capacity, Mo. 539.
- temporary, construction and adaptation, 853.
- trench, construction, Ohio 546.

Silt problem, 393.

Silviculture, theory and practice, treatise, 193.

Sinoxylon anale, pest of stored derris, 817.*Siphoninus granati*, notes, 812.

Sires—see also Bulls.

- Brahman, use, 370.
- dairy, index to quality, Mo. 525.
- proved, and partially proved dams for herd production, 524; N.Y.State 376.
- proved at earlier age by lactation records, U.S.D.A. 95.
- proved, results on use, Idaho 95.

Sirups, fermentation flavors, U.S.D.A. 436.

Sitona—

- hispidula*, see Clover root curculio.
- lineata*, egg production and longevity, factors affecting, 216.

Sitophilus oryza, see Rice weevil.*Sitotroga*—*cerealella*, see Angoumois grain moth, production, 501.

Size genes, analysis, 602.

Skim milk—

- condensed and dried, manufacture, composition, and use for feed, U.S.D.A. 832.
- dried, analysis, standards and methods, 248.
- dried, effect on properties of cream and cheese, Mo. 247.
- dried, for manufacture of cream cheese, Mo. 101.
- dried, in chick rations, proportions, Mo. 514.
- dried, use in manufacture of whipped cream, Mo. 101.
- dried, v. dried buttermilk for pigs, Wis. 515.
- for calves in feed lot, 673.
- powder, small packages for, U.S.D.A. 680.
- solutions, purification by trickling filter, effect of bottom ventilation, 117.
- v. whey for pigs on pasture, Wis. 515.
- waste, utilization, 241.

Skins, see Hides.

Skrjabinema oreamni n.sp., description, 251.

Sleep and foods, experiments with, 872.

Sludge—see also Sewage.

sludge digestion, and trickling filters, N.J. 110.

Slum clearance and rehousing, report of English Council for Research on Housing Construction, 735.

Sminthuridae of North America, redescrptions, 221.

Sminthurus viridis—

- bdellid mite predatory on, 221.
- in Australia, 220, 656.
- notes, 218.

Smith, Theobald, 1859-1934, editorial, 289.

Smoke, acids from, soil-disturbing effect, 490.

Smoke injury, estimation, chemical analyses for, 638.

Smuts—see also Grain smuts and specific hosts.

sexually bipolar and multipolar, crosses between, 790.

Snake mite, biology, 370.

Snapdragons—

- breeding, Calif. 616.
- breeding for rust resistance, 783.
- water needs, Ohio 486.

Snow—

- accumulation and melting rate in various forest cover types, 194.
- mold caused by *Sclerotium rhizodes*, 630.

scald of grains and grasses, cause, Idaho 60.

Soap, sodium and potassium, tests for Japanese beetle, 80.

Social—

- characteristics, organization, and activities on Muscatine Island, Iowa 864.
- investigation, technic, treatise, 272.
- organization, rural, in south-central Arkansas, Ark. 864.

Sociology, rural, elements, treatise, 272.

Sodium—

- alginate as suspending agent in chocolate milk, 836.
- arsenite, toxicity and fixing power, Calif. 606.
- chlorate applications, effect on subsequent sowings of wheat, N.H. 475.
- chlorate, toxicity and fixing power, Calif. 606.
- determination by uranyl zinc acetate method, 445.
- fluoride—
 - effect on rate of eruption of rat incisors and bone development and body growth, 726.
 - effect on vitamin C in organs of rat, 825.
 - toxic effect, relation to parathyroid glands, 879.
 - various amounts, effect on teeth of rats, 726.

fluosilicate, incompatibility of molasses with, 809.

nitrate for side-dressing, rates of applying, S.C. 759.

nitrate, tests of brands, S.C. 759.

nitrate, use on Corn Belt crops, Mo. 448.

salts, injury to strawberries, 625.

selenate, effect on wheat, 203.

sulfide in blowfly baits, value, 510.

Soil—

acidity—*see also* Lime, Liming, and Soils, acidic.

and liming, 23; S.C. 744.

aggregates, size distribution, application of theory of probability, 160.

analyses for lead arsenate, U.S.D.A. 653.

analyses, pipette and hydrometer method, comparison, 449.

bacteria, activity, Utah 298.

bacteria that conserve nitrogen, N.Y. State 591.

colloids, *see* Colloids.

complex, degradation and regeneration, 745.

Conservation Service, establishment, editorial, 737.

deficiencies, *Aspergillus niger* test for, U.S.D.A. 448.

erosion—

accelerated, and abnormal run-off, U.S.D.A. 541.

control, 847; Calif 700; U.S.D.A. 699.

control by checking gullies, U.S.D.A. 847.

control by terracing, P.R. 261.

Soil—Continued.

erosion—continued.

control structures, drop inlets and spillways, Wis. 700.

control with terraces and vegetation as strip crops, 701.

equipment for demonstrating and control, 395.

experiment farms, terracing, tests, U.S.D.A. 700.

experiment stations, results of engineering experiments, U.S.D.A. 700.

method of study, 315.

on cultivated land, effectiveness of proper terracing, U.S.D.A. 111.

properties affecting, Mo. 448.

properties of soils affecting, Mo. 17.

severity, differences in cause, Wis. 539.

studies, Iowa 743; U.S.D.A. 448.

vegetation dominant role, U.S.D.A. 111.

fertility—

Azotobacter test, Colo. 743.

conductivity of soil suspensions as measure, factors affecting, 747.

maintenance, W.Va. 589.

measuring, N.J. 591.

plats, Jordan, Pa. 743.

studies, Ind. 13; N.J. 14; Utah 298.

studies in Everglades, Fla. 298.

Tradescantia as test crop for, [N.Y.]Cornell 782.

friction and soil plasticity, Nebr. 743.

fungi as allergic excitants, U.S.D.A. 448.

heating, electric, 852; Idaho 110.

highly calcareous dolomitic, effect of fertilizers, Utah 317.

lines, undulating subsoil-surface, causes, 315.

map and soil type descriptions, [N.Y.] Cornell 303.

microbiology, 163; N.J. 14.

moisture—

conditions, predetermined, in irrigation maintenance, 340.

constants and their ratios in clay soils, 540.

relation to plants, 18.

relation to use of water by plants, 166.

system, 745.

nutrients, correlation with nutrients in plant and its growth, N.J. 47.

porosity as index of structure, Mo. 448.

pressure beneath a footing, distribution, 847.

profiles from Cyprus, studies, 16.

profiles, studies, 162.

properties and rainfall, functional relation, 451.

Soil—Continued.

- provinces, North Carolina, fertilizer recommendations, N.C. 304.
- reaction, response of vegetables to variation in, Ark. 768.
- richness, new measures for crop production, 315.
- Science, International Congress, notes, 144.
- solubles, displacement through plant roots by means of air pressure, 299.
- survey in—
 - Indiana, Vermillion Co., U.S.D.A. 14.
 - Michigan, Bay Co., U.S.D.A. 744.
 - Montana, Pondera Co., Mont. 160.
 - Nebraska, Sherman Co., U.S.D.A. 744.
 - Virginia, Rockbridge Co., U.S.D.A. 590.
 - western Canada, methods and scope, 15.
- tests for quality, yield, and uniform maturity, 591.
- tests, interpretation, Conn.[New Haven] 429.
- treatment, effect on bacterial activity, Mo. 448.
- treatment to maintain good tilth, Mo. 448.
- types, effect of fertilizers on crop growth, Iowa 743.
- types, factor in crop production, 315.
- types, response to calcium arsenate, 315.
- water, *see* Soil moisture.

Soils—

- acidic upland, response to treatments, 607.
- alkali, *see* Alkali.
- and field crop management, [N.Y.]Cornell 303.
- aqueous vapor pressure, measuring, 449.
- arsenic in, 452.
- base saturation, effect on its capacity to fix phosphorus, 746.
- Bedford silt loam, fertility requirements, 302.
- boiling, CO₂ produced on, U.S.D.A. 448.
- calcareous, phosphate availability in, 452.
- capacity to fix phosphorus in difficultly available form, determination, 23.
- carbon dioxide evolution in, 18.
- classification, carbon: nitrogen ratio in relation to, 161.
- compressibility and elasticity, flocculation test, 847.
- crops, and pasture management of Suffolk and Nassau Counties, New York, [N.Y.]Cornell 15.
- delta, of freshwater tide area, Ga.Coastal Plain 743.
- disinfection, Ariz. 346.
- evaporation rate, 12.

Soils—Continued.

- fertilizer needs, rapid chemical tests for, Ind. 303.
- for fertilizer experiments, importance of chemical analysis, 315.
- from erosion experiment stations, characteristics, U.S.D.A. 449.
- Hawaiian, phosphate fixation in, Hawaii [Sugar Planters'] 305.
- Indian, soil deficiency, *Azotobacter* plaque test, 455.
- infertile, U.S.D.A. 448.
- inoculation, *see* Legumes, inoculation.
- moor, *see* Moorland and Peat.
- muck, *see* Muck land.
- nutrient requirements, methods of determining, 303.
- of Illinois, response to limestone, Ill. 24.
- of Illinois, solubility of phosphorus in, 746.
- of Imperial Valley, Calif. 14.
- of Indochina, red and black basaltic, 16.
- of Iowa, base exchange in, Iowa, 743.
- of Louisiana, Coastal Prairie, profile studies, 454.
- of Malay Peninsula, bacterial numbers in, 453.
- of Maryland, distribution and character, Md. 13.
- of New Jersey, utilization for agriculture, N.J. 14.
- of Pennsylvania, minerals in, Pa. 743.
- of South Carolina, lime requirements, 315.
- of Vermont, lime requirement and use, Vt. 24.
- of Washington County, nitrogen and phosphorus in, Iowa 743.
- of western Oregon, liming, Oreg. 24.
- of Westfield vineyard area, nature, [N.Y.]Cornell 773.
- organic base exchange compounds in, 299.
- organic matter in, *see* Organic matter.
- peat, *see* Peat.
- physical and physicochemical properties and processes in, Utah 298.
- ratios of moisture equivalent to wilting percentage in, Hawaii 298.
- relation to fruit growing in New York, [N.Y.]Cornell 15.
- relation to fruit growing in New York, correction, N.Y.Cornell 744.
- shallow, favorable effect, Wis. 501.
- slick, high water requirements, Idaho 13.
- solonetz, of western North Dakota, morphology and genesis, 744.
- sterilization with steam, U.S.D.A. 545.
- studies, Calif. 589; Idaho 13; N.Y.State 589.
- suitability for orchards, ground water as measure, 477.

Soils—Continued.

- tropical, microbiology, 453.
- tropical, nitrite-forming organisms, optimum temperature, 164.
- Solanaceae, bacterial wilt of, P. R. 195.
- Solar energy values for Manila and Baguio, Philippine Islands, 423.
- Soldier fly larvae, human parasitism, 815.
- Sorghum—
 - and corn, comparison, Nebr. 758.
 - and Sudan grass hybrids, Colo. 757.
 - and sugarcane hybrids, susceptibility to diseases, 641.
 - anthesis, pollination, and fertilization, 42.
 - awn development in, inheritance, 462.
 - culture in Imperial Valley, Calif. 34.
 - diseases in Arizona, key, Ariz. 346.
 - for forage and grain, varieties and field practices, S.Dak. 178.
 - for forage in Texas, Tex. 470.
 - grain, breeding, U.S.D.A. 605.
 - grain, culture experiments, Fla. 316.
 - grain, variety tests, Ark. 756; Nebr. 758; Utah 316.
 - pastures for growing and fattening swine, Ark. 821.
 - smut hybrids, pathogenicity, 631.

Sorgo—

- breeding, U.S.D.A. 605.
- culture in Imperial Valley, Calif. 34.
- fertilizer experiments, Ky. 35.
- for sirup, variety tests, Ark. 756; Ky. 35.
- strains, classification, Ark. 756.
- variety tests, Fla. 316; Iowa 757; Nebr. 758; Utah 316.
- Sorosphaera veronicae* on corn, 346.
- South Carolina Station, notes, 431.
- South Carolina Station, report, 894.
- South Dakota College, notes, 575.
- South Dakota Station, notes, 575.
- Sows, brood, rations for, 676; Mo. 514.
- Sowthistle, perennial, tillage v. chlorates for control, cost and effectiveness, 475.

Soybean—

- diseases in Arizona, key, Ariz. 346.
- hay, machine-dried, for fattening cattle, La. 826.
- hay v. alfalfa for steers, Ky. 88.
- oil meal as emulsifier for mineral oils, 219.
- oil meal in laying rations, Wis. 515.
- oil, vitamin E in, 569.
- sauce, various brands, characteristics and composition in Philippines, 868.
- seed, storage tests, U.S.D.A. 605.
- silage for dairy cows, Fla. 376.

Soybeans—

- amino acids in, variation, U.S.D.A. 87, 436.
- and corn, production, La. 115.
- and soybean products, effect on quality of fat and lard from swine, Iowa 822.
- breeding, Iowa 757; Mo. 466; [N.Y.]Cornell 758; W.Va. 606.

Soybeans—Continued.

- Cayuga, for high-oil high-protein concentrates, [N.Y.]Cornell 42.
- certified seed production, rules and requirements for, N.J. 616.
- culture experiments, Ark. 756; Ga. Coastal Plain 757.
- culture in Imperial Valley, Calif. 34.
- cystine, tryptophane, and tyrosine in, 5.
- edible, varieties, Pa. 769.
- for growing and fattening swine, Ark. 821.
- for hay and seed, Ind. 35.
- for hay, variety tests, N.J. 35.
- germination, effect of depth of planting, 766.
- green, composition and vitamins in, Hawaii 413.
- green immature, nutritive value, 132.
- infection by *Hypochnus sasakii*, 203.
- irrigation, Ark. 756.
- oil content, U.S.D.A. 436.
- quality, U.S.D.A. 560.
- selection, S.C. 759.
- v. corn with soybeans for silage, S.C. 759.
- varieties, U.S.D.A. 605.
- variety tests, Ark. 756; Ga.Coastal Plain 757; Hawaii 316; Idaho 34; Iowa 757; Mo. 466; Nebr. 758; S.C. 759; U.S.D.A. 605, 759.
- variety-time-of-planting tests, Fla. 316.
- vegetation and reproduction, 167.
- vernalization experiments, 607.
- Spark arresters for motorized equipment, Calif. 263.
- Sphaeloma*—
 - on cultivated sweet violets, 631.
 - rosarum*, notes, U.S.D.A. 195.
- Sphaelotheca* spp., genetics, 631.
- Sphaeridiotrema globulus*, notes, 214.
- Sphaeropsis paeoniae* n.sp., notes, 70.
- Spicaria*—
 - divaricata*, spore germination, Iowa 787.
 - prasina*, notes, 813.
- Spider, black widow, great abundance, 670.
- Spider mite, see Red spider.
- Spilochalcis rufa*, notes, 370.
- Spinach—
 - aphid, *Empusa aphidis* affecting, N.Y. State 654.
 - culture and fertilizers, [N.Y.]Cornell 477.
 - damping-off, control, 631.
 - downy mildew mycelium, distribution in fruits, 641.
 - irrigation requirements, indexes, 183.
 - premature seeding, [N.Y.]Cornell 770.
 - seed clusters, *Peronospora effusa* affecting, 630.
 - tobacco mosaic on, 633.
 - varieties, 330.
 - variety tests, Wis. 477.
- Spirochetosis in Greece, 258.

Spray—

for deciduous fruit trees, tank-mixture method, Calif. 360.

materials, effect on transpiration, 632. problems, old and new, 218.

residue on fruits and vegetables, 654; N.Y.State 617; U.S.D.A. 502.

residue removal, 52; N.J. 52; [N.Y.]Cornell 773.

residue removal from apples, 188.

residue tolerance, resolution concerning, 216.

systems, stationary, in State, W.Va. 655.

Spraying—*see also* Dusting and specific crops.

experiments, Ky. 74.

forty-two orchards, labor and equipment used in, N.H. 337.

machinery for applying atomized oil, 544.

machinery, nozzles, 705.

outfits, stationary and portable, costs, Ind. 46.

quantity of liquid used, device for regulating, 77.

Sprays—*see also* Fungicides, Insecticides, and specific forms.

copper, *see* Copper.

oil, *see* Oil sprays.

surface area of trees covered by and degree of fineness of deposit, 59.

Springtails, injury from, 73.

Spruce—

Black Hills and Colorado blue, performance, Nebr. 769.

Engelmann, pathological enlargement of resin canals, 803.

gall aphid, notes, N.Y.State 654.

red, germination, 56.

trees tapped for resin, effect, 70.

Spurge, leafy, control, N.Dak. 326.

Spurge, leafy, spread and control, Iowa 757.

Squashes—

fertilizer experiments, P.R. 182.

metaxenia in, 311; Mo. 476.

reciprocal crosses, hybrid vigor in, 601.

response to fertilizers, S.C. 769.

table sirup derived from, analyses, Conn.[New Haven] 130.

varieties for winter use, N.Y.State 330.

variety, relation to character of canned product, N.Y.State 617.

Squirrel—

crossbill, and great spotted woodpecker, mutual relations, 651.

Douglas ground, burrows and burrowing habits, 213.

ground, life cycle and laws of development of plague epizootic, 691.

Squirrels, tularemic epizootic, role of ectoparasites in, 838.

Stable flies—

development and control, 664.

transmission experiments of anaplasmosis by, 837.

transmission experiments with yellow fever virus, 531.

unusual outbreak and control, 501.

Stable sanitation for combating infectious mastitis, Mich. 533.

Stallions, oestrogenic hormone in urine, 34.

Standard of living of farmers, immediate readjustments needed, Okla. 401.

Starch—

determination methods, 296.

in cowpeas and sugar beets, effect of potassium, 165.

Starling—

roosts, winter, in Great Britain, 805.

trap, description, N.Y.State 652.

Starvation, effect on anthelmintic efficiency, 382.

Steam sterilization of soils, methods, U.S. D.A. 545.

Steers—*see also* Cattle, beef.

fattening methods of feeding cottonseed meal and hulls, S.C. 823.

fattening, mineral supplements for, Colo. 674.

fattening, value of molasses for, Wis. 515.

fattening, value of warm drinking water and shelter, Idaho 87.

fattening with blackstrap molasses, 370.

finishing on grass, Iowa 822; W.Va. 671.

gains, relation to feeder grade, Pa. 823.

home-grown feeds for, efficient combinations, Wyo. 671.

supplemental feeds for, value, Calif. 671.

yearling, protein requirements, [N.Y.] Cornell 822.

yearling, protein supplements, Mo. 514.

Stegomyia, biology under laboratory conditions, 662.

Stem borer, notes, N.J. 75.

Stephanofilaria—

dedoesi n.g. and n.sp., description, 839.

stilesi n.sp. from skin of cattle in United States, 840.

Stephanofilariasis in cattle, 214.

Stephanurus dentatus larvae, effect of copper sulfate, 214.

Stereum—

gausapatum, cause of heart rot of oaks, 356.

induratum causing dry rot of fagaceous woods, 211.

Sterility in cattle, physiologic and pathologic aspects, 387.

Sternonchus mangifera, *see* Mango weevil.

Sterols and bile acids, ring system, 587.

Stethorus punctillum, natural enemy of red spider, 817.

Stewart's disease, relation to winter temperatures, U.S.D.A. 195.

Stilbum—

cinnabarinum, cause of new fig disease. 632.

on fig in Louisiana, 346.

Stinkbug—

green, life history, habits, and control, Va. 223.

Say's, notes, Mont. 807.

Stock and scion relations, N.Y.State 617.

Stock foods, *see* Feeding stuffs.

Stocks, breaking in, 632.

Stomach worms of sheep, control, W.Va. 695.

Stomatitis—

vesicular, U.S.D.A. 528.

vesicular, virus and virus of foot-and-mouth disease, differentiation, 691.

Stomoxys calcitrans, *see* Stable fly.

Storages for farm home, 117.

Strawberries—

Blakemore, culture and handling, 624.

breeding, 482; N.J. 47; U.S.D.A. 616.

buttoning, control, Mo. 501.

culture, Ohio 47.

fertilization, Ark. 768; U.S.D.A. 448.

fertilizer requirements, Mo. 476.

growth, effect of reaction of nutrient medium, 340.

irrigation requirements, indexes, 183.

nutrition, N.J. 47.

nutrition under controlled conditions, 625.

response to various soil treatments, Iowa 768.

summer mulching, Mich. 482.

varieties, Nebr. 769; U.S.D.A. 616.

varieties, adaptation, plant spacing a major factor, 340.

varieties, adaptation to southeastern Iowa, Iowa 768.

varieties, day length requirements, U.S.D.A. 624.

variety tests, Ky. 47; S.C. 769.

Strawberry—

black root injury, 625; Wis. 489.

chlorosis, control, N.J. 47.

crosses, wild and everbearing, size of fruit, 777.

crown borer, studies, Ark. 806.

diseases, Fla. 346.

flower bud formation, effect of differential nutrients, Mo. 476.

ice cream, causes of tallowy flavor in, Iowa 830.

ice cream, stale, metallic flavor in, causes, Ill. 687.

leaf blights, control, La. 68.

root rots, Utah 347.

root weevil, notes, N.Y.State 654.

wilt, cause, 630.

wilt or crown rot, Fla. 347.

Stream—

discharge, relation to precipitation, Utah 393.

flow, measurements in Hawaii, 262.

Stream—Continued.

flow, obstruction offered by pile trestles, U.S.D.A. 541.

Streptococci—

contamination of dairy barns with, Mich. 533.

hemolytic, studies, Ky. 102.

lactic, effect on acid formation in milk, 833.

lactic, effect on ripening of Cheddar cheese, 836.

nonpathogenic hemolytic, in milk, 833.

of mastitis, viability, 533.

Streptococcus—

lactis and *S. fecalis*, differentiation, 377.

lactis, growth rate and acid production, 377.

mastitidis, notes, 259.

thermophilus, notes, 686.

Stripe rust in Canada, 631.

Strongyloides ransomi, life cycle and behavior of infective larvae, U.S.D.A. 695.

Sturmia inconspicua, notes, 365.

Styloneuria discrepans, biology and larval forms, 229.

Subsistence homesteads—

planning, U.S.D.A. 127.

possibilities and limitations, 854.

program, research needed for, 853.

Subtropics, arid, of Central Asia, climatological and meteorological data, 741.

Sudan grass—

and sorghum hybrids, Colo. 757.

artificially dried, digestibility, Vt. 95.

diseases in Arizona, key, Ariz. 346.

feeding, poisonous effect, Mo. 528.

for growing and fattening swine, Ark. 821.

green, v. green panicum grass for dairy cows, Hawaii 831.

hay, early-cut, and silage as grain saver, Vt. 95.

in rotation, effect on corn yields, Iowa 757.

v. sorghum with and without tankage, Ark. 821.

vernalization experiments, 607.

Sugar, acids produced from, by *Penicillium* parasitic on *Aspergillus niger*, 438.

Sugar analysis, use of micro-organisms in, 157.

Sugar beet—*see also* Beet.

crop, piece work on, 266.

curly top and leaf spot resistance in, U.S.D.A. 634.

curly top, changes in anatomy of leaves, 353.

curly top, localization of symptoms, 633.

curly top, notes, Calif. 634.

curly top reduction by range improvement, U.S.D.A. 634.

diseases of seedlings, relation to acid soils, Iowa 787.

heart rot, effect of rainfall, 641.

Sugar beet—Continued.

- industry, assistance to, 266.
- industry, British, ten years' progress under subsidy, 552.
- leaf spot, spread and effects, Iowa 787.
- maggot, unidentified, notes, Mont. 807.
- nematodes and shadscale, U.S.D.A. 633.
- planter, hill-drop, Calif. 700.
- products for fattening lambs, 827.
- residues, galacturonic acid from, 152.
- Rhizoctonia* disease, studies, 206, 789.
- root rot, organisms associated with, 206.
- root rot, southern, Calif. 634.
- seed production in America, U.S.D.A. 34.

Sugar beets—

- bolters and woody, composition, 43.
- bolting in, 43.
- breeding, U.S.D.A. 605.
- composition, effect of potassium, 165.
- culture experiments, 35; Iowa 757; Utah 316.
- culture in Imperial Valley, Calif. 34.
- experiments, Calif. 606.
- fertilizer experiments, 35, 36; Nebr. 758; U.S.D.A. 448, 611, 759; Wyo. 606.
- mechanical blocking and cross cultivation, U.S.D.A. 323.
- paraffin for overwinter storage, 471.
- phloem in, ontogeny, 594.
- prices and index numbers, Mich. 124.
- production, improved machinery for, U.S.D.A. 699.
- rotation experiments, U.S.D.A. 759.
- studies, U.S.D.A. 436.
- weight and composition during first growth year, 611.

Sugar—

- in blood, *see* Blood sugar.
- in cowpeas and sugar beets, effect of potassium, 165.
- industry in Mysore, development, 269.
- intake, varying, effect on nitrogen, calcium, and phosphorus retention of children, 724.
- manual, Puerto Rico, 612.
- production, development and probable future, 708.
- sirups, spoilage in, U.S.D.A. 436.
- solutions for culture media, effect of heat, 6.

Sugarcane—

- and sorghum hybrids, susceptibility to diseases, 641.
- bacterial diseases, distribution and control, 798.
- boenting in, effect of ethylene chlorohydrin, Fla. 316.
- borer, campaign against, 656.
- borer, control by *Trichogramma minutum*, 80.
- borer in Barbados, mathematical analysis of conditions, 669.
- borer in south Florida, Fla. 358.

Sugarcane—Continued.

- borer parasites, mass rearing and liberation, 655.
- borer, rate of egg deposition and larval mortality, relation to *Trichogramma*, 668.
- borer, varietal susceptibility, determination, 661.
- borers in Queensland, 359.
- borers, new parasite for, 510.
- breeding, Fla. 316; U.S.D.A. 605.
- breeding and cultivation in Florida, P.R. 324.
- breeding and other research, 606.
- cultivation tests, results, 324.
- culture experiments, Fla. 316.
- cuttings, germination, 324.
- damage by rats, Fla. 316.
- diseases, minor, in Puerto Rico, P.R. 195.
- effect of soil moisture on photosynthesis and carbohydrate accumulation, Hawaii [Sugar Planters'] 308.
- fertilizer experiments, Fla. 316; U.S.D.A. 448.
- field experiments, 178.
- Fiji disease, notes, 789.
- frozen in advanced stages, handling, U.S.D.A. 179.
- frozen, methods of treating, U.S.D.A. 605.
- growth and quality, relation to weather, 159.
- insects, control in Queensland, 359.
- insects, notes, U.S.D.A. 653.
- lands, drainage, U.S.D.A. 699.
- mealybug parasites, P.R. 216.
- mosaic in Antioquia, 642.
- mosaic, new type, U.S.D.A. 634.
- mosaic, new vector, U.S.D.A. 653.
- mosaic, notes, 789.
- mosaic, resistance in Puerto Rican seedlings, P.R. 195.
- mosaic, types in Louisiana, 642.
- mosaic, varietal resistance, Fla. 347.
- mosaic virus, biology, U.S.D.A. 634.
- pests, control, 808.
- plant capacity to absorb water through aerial parts, 741.
- research at field stations in the South, P.R. 471.
- research in Puerto Rico, P.R. 174.
- ring spot disease, Fla. 347, 353.
- root borer, notes, 655; P.R. 216.
- root distribution in Trinidad soils, 324.
- root rot, predisposing factors, in, 798.
- seedling S.J. 4, resistance to grub damage, 359.
- storage studies, U.S.D.A. 471, 605.
- stubble deterioration, La. 766.
- studies, U.S.D.A. 436.
- varieties, U.S.D.A. 605.
- variety P.O.J. 2878 in Puerto Rico, P.R. 179.
- variety tests, Fla. 316.
- weevil borer, morphology and biology in Peru, 818.

Sugars—*see also* Glucose, Lactose, *etc.*

and lactose formation, 523.

Sulfate in potato tubers, 593.

Sulfate of ammonia, *see* Ammonium sulfate.

Sulphydryl compounds, oxidation by hydrogen peroxide, 151.

Sulfur—

burning, apparatus for, U.S.D.A. 653.
compounds, reaction with nitrous acid, 437.

compounds, spraying with, Ohio 47.

dioxide, atmospheric, effect on cotton textiles, 573.

dusts for citrus thrips and scales, 219.

excretion of mature animals and body weight, Mo. 824.

for mushroom fumigation, U.S.D.A. 502.

in wool, distribution and origin, 441.

mineral, direct use for powdery mildew, 198.

mixtures, *see* Lime-sulfur.

on leaves, quantitative determination, 295.

sprays, adhesiveness, N.J. 60.

sulfate toxicity for *Sclerotinia americana*, 631.

synthetic compounds containing, U.S.D.A. 502.

toxicity for *Sclerotinia americana*, 631.

Sulfuric acid as used for damping-off, effect on pH of soil, 630.

Sun lamp, plant test with, 457.

Sun spots and business cycles, relation, 740.

Sunflowers, culture experiments, Fla. 316.

Sunlight—*see also* Light.

ultraviolet limit of, 423.

Sunshine, duration, relation to radiation from sun and sky, 588.

Superfetation, two cases in rats, 34.

Superphosphates, ammoniated and other phosphates, comparison, 304.

Suprarenal medulla, vitamin C in, 731.

Surra, treatment—

in native Philippine horses, 535.

in Punjab, history, 691.

Swamp, irrigated reclaimed, pasture species on, 318.

Swede—

clubroot resistance, Wis. 489.

tops and marrow stem kale silage, composition and digestibility, 832.

Swedes—

feeding value, 675.

variety tests, Wis. 477.

yields, Utah 327.

Sweet corn—*see also* Corn.

bacterial wilt, N.Y.State 635.

bacterial wilt, susceptible varieties, N.J. 60; Wis. 489.

breeding, Iowa 769.

breeding for resistance to bacterial wilt, U.S.D.A. 633.

culture and fertilizers, [N.Y.]Cornell 477.

Sweet corn—Continued.

ear worm resistant strains, Utah 327.
historical and botanical status, N.Y.

State 329.

hybrid and open-pollinated varieties, yields, 771.

hybrid, for home and market gardener, 329.

hybrids, Conn.State 771; N.Y.State 617.

quality, factors affecting, N.Y.State 617.

shipping, P.R. 182.

Stewart's bacterial wilt on, Conn. [New Haven] 429.

stover, time to harvest, Md. 38.

varieties, Hawaii 327.

varieties, ear worm damage in, 329.

varieties, new, development, Fla. 326.

variety tests, Idaho 46; Ky. 47; Wis. 477.

Sweet peas—

greenhouse, culture, N.J. 47.

water needs, Ohio 486.

Sweetclover—

alfalfa, and red clover as soil-building crops, comparison, Iowa 743.

as summer pasture, W.Va. 680.

biennial, eradication, Iowa 757.

biennial white, winter hardiness in, Iowa 757.

composition, effect of soil treatment, 179.

culture in Imperial Valley, Calif. 34.
effect on soil productivity, U.S.D.A.

759.

pasture, increasing efficiency, Idaho 87.

pasturing with dairy cows, U.S.D.A. 831.

pasturing with sheep, U.S.D.A. 826.

roots, invasion by *Sclerotinia* sp. and *Plenodomu meliloti*, 796.

seeds, weight for 1,000, Md. 45.

spring dying due to *Pythium*-like fungus, Ky. 60.

variety tests, Fla. 316; Iowa 757.

white, diseases in Arizona, key, Ariz. 346.

Sweetgum, planting experiments, Ark. 784.

Sweetpotato—

black rot, control, 345.

plants, treatment for control of black rot, 799.

ring rot, 352.

roots, knob and elevated vein formations, 598.

scurf and stem rot, control, N.J. 60.

seed stock, treatment to reduce stem rot, Iowa 787.

seedlings from seed-ball method of propagation, Iowa 757.

stem rot, studies, 207.

storage rots, prevention, U.S.D.A. 352.

weevil, studies, P.R. 216; U.S.D.A. 653.

Sweetpotatoes—

culture experiments, Ga.Coastal Plain 757.

Sweetpotatoes—Continued.

- fertilizer experiments, Ark. 756; Ga. Coastal Plain 757.
- in sand culture, nutrition, N.J. 35.
- Porto Rico, effect of planting date on shape, 331.
- Porto Rico, grade and yield, effect of potash, 331.
- Porto Rico, improved strain, 316.
- Porto Rico, yield and size, U.S.D.A. 612.
- Prolific, vitamin A in, effect of fertilizers, Iowa 866.
- propagation, effect of temperature and character of bedded roots, 331.
- sprout production, effect of nutrient solutions, N.J. 35.
- storage quality, effect of fertilizers, Iowa 757.
- utilization for starch, U.S.D.A. 436.
- variety tests, Ga.Coastal Plain 757; Hawaii 316; S.C. 759.

Swine—see also Pigs and Sows.

- blood chemistry, 372.
- breeding stocks, control, 676.
- disease, new, differing from foot-and-mouth disease and vesicular stomatitis, Calif. 689.
- Duroc-Jersey, white spotting in, 463.
- erysipelas, studies, 534; Colo. 837; Nebr. 837; U.S.D.A. 528.
- feeding, breeding, and management, U.S.D.A. 514.
- inbreeding and crossing, U.S.D.A. 463.
- nodular worm resistance, effect of ferrous sulfate and copper sulfate, 688.
- paralysis, relation to vitamin A deficiency, 519.
- parasites of, U.S.D.A. 528.
- record-of-performance studies, Iowa 822; U.S.D.A. 671.
- worm parasites in, 214.

Sycamore anthracnose, symptoms, 789.

Symptomatic anthrax, see Blackleg.

Synanthedon pictipes, summary, S.Dak. 79.

Syrphus flies of America north of Mexico, revision, 814.

Tabanidae of South and Central America, catalog, 510.

Tabanus stygius, notes, Ark. 806.*Tachypterellus quadrigibbus*, see Apple curculio.*Taenia pisiformis*, notes, 699.

Taeniothrips—

gladioli, see Gladiolus thrips.

inconsequens, see Pear thrips.

Takuwan, commercial, vitamin B₁ in, Hawaii 413.

Tangelos, new varieties, 781.

Tangerine, Chinese, vitamins A and B in peels, 564.

Tankage v. meat scrap in chick rations, Wis. 515.

Tapeworms—

in fowls of Kansas, 257.

in sheep, control, 102.

Tar distillate sprays, N.Y.State 654; Pa. 807.

Tar distillates as insecticide, 217.

Tar oil wastes, utilization, 852.

Tariff—

bibliography of, 270.

efficiency, procedure for testing, 856.

Tarnished plant bug—

injury to celery, [N.Y.]Cornell 807.

on strawberries, control, Mo. 501.

Tarsonemus—

mites in greenhouse, U.S.D.A. 653.

translucens, notes, 820.

Taste and chemical constitution, 870.

Tax—

delinquencies, rural, in California, Calif. 412.

rates and tax delinquency, Mo. 547.

relief for farmer, relation to public-finance problem, U.S.D.A. 118.

Taxation—

farm, Ky. 118.

laws of Michigan, handbook, Mich. 712.

Taxes—

average uncollected, [N.Y.]Cornell 855.

farm real-estate, delinquent in South Carolina, S.C. 270.

farm real-estate, in Kentucky, index, Ky. 711.

on farm property, 1930 census data, 551.

per acre of forest and agricultural lands, Wis. 547.

Tea tortrix, control, 808.

Teak defoliators, biological control, 813.

Teeth—

decay, cause, 733.

decay, of Texas school children, Tex., 136.

decay, relation to diet, 137, 890.

of rats, effect of sodium fluoride, 726.

scorbutic changes and effect of synthetic vitamin C preparations, 569.

Temperature—see also Climate and Soil temperature.

air, effect of forests, 298.

and precipitation map of United States, 160.

environmental, and dairy cows, 524.

in forests, vertical distribution, 447.

new measures for crop production, 315.

vital optimum, of an organism, 217.

Tenebrio molitor, see Meal worm, yellow.*Tenebrioides mauritanicus*, see Cadelle.

Tent caterpillar, eastern—

control, N.J. 74.

cycles of abundance, N.J. 660.

Termites—

control, 656.

dry wood, lime-sulfur as control, Fla. 858.

in Tanganyika, 655.

protection of seeds and plant cuttings against, 808.

susceptibility of timbers to, methods of testing, 658.

Termites—Continued.

- western subterranean, control and prevention, Calif. 506.
 - zinc chloride for soil treatment of, 506.
- Terpenes, reactions with antimony trichloride, 583.

Terracing—

- in Alabama, 701.
- in land use program, U.S.D.A. 701.
- machine, new type, development, Iowa 846.

Testicular hormone, effect of alkali, 756.

Tetanus, equine, treatment with intrathecal injection of antitetanic serum, 842.

Tetracnemus pretiosus, biology, 667.

Tetragoneuria, host of *Prosthogonimus macrorchis*, Minn. 392.

Tetrameres, male and female, coexistence in Florida grackle, 214.

Tetranychus sezmaculatus, see Mite, six-spotted.

Tetranychus telarius, see Red spider.

Textiles—see also Fabrics.

- and clothing, tests, U.S.D.A. 572.

Thamnotettia—

- geminatus*, notes, Calif. 647.
- montanus*, notes, Calif. 647.

Theelin injections, effect on mammary development, [N.Y.]Cornell 756.

Thermocouple system, three-wire, for use in cryoscopic investigations, 593.

Thermohygrostat with internal air circulation, home-made, 217.

Thiocyanogen compounds, organic, as insecticides, 503.

Thiol compounds, effect on action of phenols on urease, 153.

di-2-Thiolhistidine electrometric titration, 151.

Thistle—

- Canada, tillage v. chlorates for control, cost and effectiveness, 475.
- Canada, wilt of, Colo. 787.
- Russian, control, Calif. 606.

Thresher—

- injury to lima beans, Calif. 115.
- portable small grain, 706; Mich. 286.

Thrips—

- angusticeps*, injury to brussels sprouts seed bed, 507.
- imagnis*, fluctuations in numbers near Melbourne, 811.
- imagnis*, studies, 218, 222.
- occidentalis*, notes, Utah 359.
- tabaci*, see Onion thrips.

Thrips—

- flower, tobacco, and onion, life cycles, comparison, 506.
- on seedling cotton, 77.
- on tomatoes, 218.
- transmission of tomato spotted wilt by, 632.

Thurberia weevil—

- control, U.S.D.A. 653.
- quarantine work with, U.S.D.A. 653.

Thyroid gland feeding, effect on milk and fat secretion, 98.

Thyroxine—

- and tyrosine, relationship, 437.
- and vitamin B, Ark. 885.

Thysanoptera—

- artificial feeding, 658.
- of Egypt, 659.

Tick parasites in South Africa, search for 529.

Ticks—see also Cattle tick.

- and tick-borne diseases in South Africa, summary, 530.
- eradication, U.S.D.A. 528.
- in hill pastures, role of alternative hosts, 820.

- in Kenya Colony, 820.

- prevalence in New South Wales, 670.

Tide gates, automatic, for control of sand flies and salt marsh mosquitoes, 688.

Tillage—

- deep, implements for, Idaho 110.
- machinery, N.J. 110.

Tilletia—

- horrida*, notes, Ark. 787.

- levis* chlamydospores, soil infestation in Montana, 632.

- tritici*—see also host plants.

- two forms, differences in smut balls, 630.

Timber—see also Lumber and Wood.

- decay, effect of nitrogen in, 211.
- decomposition under industrial conditions, 649.
- rotting fungi of Arkansas, Ark. 787.

Timbers—

- of United States, identification, 57.
- of world, characteristics and uses, 57.
- susceptibility to termites, methods of testing, 658.

Timothy—

- and alfalfa hay for dairy farms, Ohio, 36, 96.
- certified seed production, rules and requirements for, N.J. 616.
- hay, early-cut, fertilized with a nitrogenous fertilizer, value for dairy cows, [N.Y.]Cornell 830.
- hay, yield and quality, improvement, Wis. 448.
- infusions, forms of nitrogen in, 150.
- seeds, weight for 1,000, Md. 45.
- variety tests, N.J. 35.

Tinea, see Clothes moths.

Tiphia segregata, release and spread for Asiatic beetle control, Hawaii, 817.

Tissues—

- human, vitamin C in, 885.
- presence of silica in, 151.

Titanium in soils, 156, 162.

Toad—

- giant, release and spread for Asiatic beetle control, Hawaii 817.
- giant tropical American, introduced into Hawaii, Hawaii [Sugar Planters'] 357.
- South African, use for diagnosing pregnancy, 172.

Toads—

- and frogs, handbook, 500.
- aquatic migration, 805.

Tobacco—

- and nicotine, studies, U.S.D.A. 653.
- beetle, effect of cool temperatures on some stages, 232.
- beetle, new parasite, 84.
- beetle, suction light traps for, 81.
- black root rot, resistant strain, Wis. 467.
- boron deficiency, external and internal symptoms, 799.
- breeding and other research, 606.
- brown root rot infected soils, management, Md. 14.
- casebearer, control, Fla. 358.
- cigar and cigarette types, differences, U.S.D.A. 605.
- cigarette and cigar types, composition and properties, 613.
- complex virosis, 631.
- consumption, estimates, effect of adjustments in stocks reports, 854.
- culture in Connecticut, Conn.[New Haven] 324.
- cured, insects attacking in warehouses, control, U.S.D.A. 653.
- curing and fermentation, principles, 293.
- curing, importance and daily forecasting of wind velocity, 298.
- curl and crinkle diseases, control, 799.
- disease resistant, selection and development, P.R. 195.
- diseases, studies, Ky. 60; U.S.D.A. 65.
- distribution by groups of grades, Ky. 118.
- downy mildew, control, S.C. 789; U.S.D.A. 642.
- downy mildew, effect of overwintered plants, wild hosts, and spraying, 642.
- downy mildew, notes, Fla. 347.
- downy mildew, varietal susceptibility and control, Ga. 787.
- effect of soil reaction, 207.
- ethylene treatment, 614.
- fermentation, 43.
- fertilizer and irrigation tests, P.R. 174.
- fertilizer experiments, 467; Ga.Coastal Plain 757; N.C. 43.
- green manuring with crotalaria, 324.
- infusions, forms of nitrogen in, 150.
- leaf, auxin in, distribution, 593.
- mildew or blue mold, control, U.S.D.A. 634.
- mosaic—
 - and spot necrosis, acquired immunity in, 629.
 - control by cultural practices, N.C. 65, 66.
 - on spinach, 633.
- mosaic virus—
 - ability to localize, inheritance, 642.
 - chemical studies, 799.
 - concentration, determination, 629.

Tobacco—Continued.

- mosaic virus—continued.
 - effect of trypsin, 643.
 - in isolated root tips, cultivation, 642.
 - increase in absence of chlorophyll and light, 800.
 - masked strain, 495.
 - neutralization by immune sera, 800.
 - particles, shape, 632.
 - purification, 632.
- mosaic viruses, green and yellow, differentiation, 630.
- moth, notes, 365.
- nicotine content, U.S.D.A. 605.
- plants, topping, structural responses, 613.
- prices and seasonal movements, Ky. 118.
- production, development and probable future, 708.
- production, geographical variation in, Ky. 118.
- ring spot virus, increasing resistance to aging in vitro, 630.
- ring spot virus, neutralization by immune sera, 800.
- root knot, varietal susceptibility and control, Ga. 787.
- seed, germination, Fla. 316.
- slime sickness, effect of soil reaction, 207.
- stem-borer, notes, 365.
- studies, Ky. 35; S.C. 759.
- synthetic fertilizers and different cropping systems, merits, U.S.D.A. 605.
- thrips, life cycle compared with other thrips, 506.
- Turkish, chlorosis in, Ky. 60.
- Turkish, in acid soils, toxicity of manganese to, 748.
- value of natural weed fallow in cropping system, Md. 43.
- variety tests, Fla. 316.
- wildfire and blackfire leaf spots, U.S.D.A. 634.
- wildfire, control, Pa. 789.
- wilt, notes, U.S.D.A. 195.

Tomato—

- Australian spotted wilt in Wisconsin, 498.
- bacterial canker, studies, N.J. 60; U.S.D.A. 633; Utah 347.
- black spot, control, Fla. 346.
- curly top and psyllid yellows, Utah 347.
- curly top, studies, Idaho 60; U.S.D.A. 195.
- curly top virus, passage through callus of graft union, 643.
- damping-off, control, Mo. 488.
- dieback streak, host responses in graft transmissions, 633.
- diseases, studies, 352.

Tomato—Continued.

fruit rot due to *Cladosporium fulvum*, 801.

Fusarium and related wilts, Utah 347.
juice, quality, N.J. 47.

juice, sterilization, Iowa 894.

late blight, Conn.[New Haven] 429.

leaf mold resistance, breeding for, Ohio 208.

mosaic disease, Utah 347.

mosaic leaf abnormalities, factors affecting, 631.

mosaic, water loss in, 630.

mosaic, yellow, experiments with, 632.

navelhead spot, 345; Fla. 346.

plants, composition, effect of nitrogen, phosphorus, and potassium, Ark. 768.

pulp, juice, and catsup, spoilage, N.Y. State 581.

root tips, excised, potentially unlimited growth in liquid medium, 185.

seedlings, fertilizer experiments, N.Y. State 617.

seedlings, tests with sun lamp, 457.

spotted wilt and ring spot disease, identity, 197.

spotted wilt, description and hosts, 66.

spotted wilt, studies, 352; Calif. 634.

spotted wilt, transmission by thrips, 632.

streak diseases, identification, 643.

triploid, anomalous segregation, 31.

Verticillium wilt, seed transmission, 800.

wilt, control, Fla. 346.

Tomatoes—

abnormalities in flower and fruit, 772.

alcohol and acetaldehyde production by, 51.

arsenical residue removal from, N.J. 52.

assimilation of ammonium and nitrate nitrogen, effect of pH, 22.

breeding, Calif. 616; N.J. 47.

canned, vitamins in, Iowa 866.

conducting tissue, nitrate nitrogen and phosphate phosphorus in, Ky. 455.

culture and fertilizers, [N.Y.]Cornell 477.

culture experiments, Ga.Coastal Plain 768.

decay in transit and storage, tests of chemical washes for, 644.

disease resistant, selection and development, P.R. 195.

effect of copper, boron, iodine, bromine, and arsenic mixture, Ky. 47.

effect of spacing on later development and yield, Ky. 47.

fertilizer experiments, Ark. 768; Fla. 298; Ga.Coastal Plain 768; P.R. 182; S.C. 769.

flower abscission in, causes, Ohio 48.

greenhouse, nutritional deficiencies, Ohio 48.

greenhouse, pruning, 772.

improvement by selection, Utah 327.

Tomatoes—Continued.

inheritance of fruit size and shape in, Iowa 768.

iodized wraps for prevention of rotting, 773.

metabolism, effects of humidity, 48.

planting in groups of four, Ky. 47.

pruning and training, Ark. 768.

puffiness of, U.S.D.A. 633.

races with long and short A chromosomes, 753.

resistant to *Cladosporium* leaf mold, [N.Y.]Cornell 788.

spacing, Idaho 46.

staking and pruning experiments, 185.

storage, 52.

sulfur metabolism, N.J. 47.

transplanting, 328.

tropically grown, storage, 331.

varieties, Iowa 769; Pa. 769.

variety tests, Ark. 768; Ga.Coastal Plain 768; Ky. 47; Wis. 477.

vernalization experiments, 607.

wrapping and quality, 772.

wrinkled, factors affecting production, 772.

yields, factors affecting, Ky. 47.

Tools, storage for farm home, 117.

Tortoise beetle, life history, 665.

Tortrix postvittana, notes, 509.

Toxemia in sheep, Mo. 528.

Toxoplasma microti n.sp., description, 804.

Trachelus tabidus, notes, Ohio 233.

Tractor—

drivewheels, performance, effect of diameter, 850.

wheel efficiency, Iowa 846.

Tractors—

Diesel, use, Idaho 110.

pneumatic tires for, Nebr. 846.

repair and maintenance, Ill. 115.

rubber tires and steel wheels, comparison, Nebr. 848.

studies, 404.

use, Iowa 846.

Tradescantia as test crop for soil fertility, [N.Y.]Cornell 782.

Trading in futures and price fluctuations, 716.

Trametes—

dickinsii causing dry rot of fagaceous woods, 211.

pini, biology, 649.

radiciperda, notes, 71.

Transpiration—

daily curve, effect of bordeaux and oil sprays, Ohio 198.

effect of spray materials, 632.

rate, effect of copper-containing fungicides, Ohio 790.

Transportation, inland, principles, 713.

Trapping, live, methods, 213.

Trash fish parasites, 73.

Tree—

bark discoloration, relation to fire wounds, U.S.D.A. 55.

Tree—Continued.

diseases of Iowa, mycological survey, Iowa 788.
growth, eccentric, cause, Vt. 55.
trunks, diametral changes in, 628.
wounds, treatment and care, U.S.D.A. 628.

Trees—

coniferous, *see* Conifers.
effect of mycorrhizas, U.S.D.A. 633.
evergreen, *see* Evergreens.
fire injured, entomological factors affecting salvage, 808.
forest, breaking dormancy in, methods, 194.
forest, breeding, 343, 628.
forest, fungi attacking in North Caucasus, 803.
forest, isolated, distribution of soil moisture under, 629.
forest, pruning value, U.S.D.A. 55.
forest, seeds, importance of origin, 344.
forest, systematic dendrology, U.S.D.A. 57.
gases in, composition, Minn. 458.
hardwood—
 adaptability in Panguitch Valley, Utah 327.
 growth, specific gravity, and shrinkage, 345.
 in southern Appalachians, relation between size and mortality by fire, 785.
 Nectria canker affecting, [N.Y.] Cornell 788.
 utilization in New York, 488.
killing to prevent root suckers and sprouts, [N.Y.] Cornell 784.
measurements, climbing method for taking, 345.
ornamental, care and repair, 192.
shade and orchard, protection from Japanese beetle, U.S.D.A. 81.
shade, growth, 784.
shade, insects affecting, Mont. 807.
shade, recent developments in Cornell experiments, 784.
shelter belt—
 and marginal land, 447.
 for Great Plains, U.S.D.A. 616.
 planting project, 447.
 project, start of work by Forest Service, 448.
small, measuring, Craighead diameter tape for, 486.
tests on dry and irrigated land, U.S.D.A. 770.
thinning, method of determining spacing in, 486.
timber, breeding, U.S.D.A. 55.
vegetative propagation, 53.
windbreak, growth and effectiveness in High Plains area, [Okla.] Panhandle 628.
winter injury, modification, N.J. 801.
young, crotch angles in, 479.

Trematodes, adhesive organs, new term for, 214.
Trestles, pile, as channel obstructions, U.S.D.A. 541.
Triatoma protracta infection with American human trypanosomiasis, 531.
Tribolium confusum, *see* Flour beetle, confused.
Trichinella spiralis, encysted larvae, effect of low temperature freezing, 389.
Trichloroacetic acid, titration of proteins with, 581.
Trichobaris trinotata, *see* Potato stalk borer.
Trichoderma—
 and other soil fungi, interaction, 632.
 lignorum on *Rhizoctonia solani*, lethal principle effective in action, 790.
 rot of lemons and oranges, types, 633.
Trichogramma—
 japonica, mass production for control of rice pests in Malaya, 820.
 lutea, notes, 365.
 minutum for control of sugarcane borer, 80, 84, 668.
 minutum, introduction into Puerto Rico by airplane, P.R. 216.
 minutum, mass rearing and liberation, 655.
 minutum, notes, Fla. 358; Md. 508.
 minutum, two races, temperature and humidity relations, 669.
 spp., biology, effects of refrigeration, 232.
Trichomonas—
 infection in cattle, 693.
 new species from birds, 215.
Trichomoniasis in pigeons, 698.
Trichopoda pennipes, notes, 224.
Trichostrongylus—
 spp., notes, 694.
 tenuis in domestic and game birds in United States, 215.
Trichothecium plasmoparae n.sp., description, 646.
Trichuris leporis, notes, 699.
Tridacus d'emmerezi, notes, 656.
Tritogenaphis eupatorifoliae n.sp., description, 812.
Trogoderma granarium, biological studies, 217.
Trout—
 brown, winter food, 805.
 nutritional requirements, [N.Y.] Cornell 822.
 of Oregon, food, Ore. 72.
 parasites, Ore. 73.
Truck crops—
 California, monthly prices on different markets, Calif. 860.
 culture experiments, Ga.Coastal Plain 768.
 effect of preceding crop, 183.
 fertilizer experiments, Ga.Coastal Plain 768.
 index constructed with thirteen products, U.S.D.A. 118.

Truck crops—Continued.

- irrigation experiments, use of evaporation records in, 183.
- on sandy soils, place of fertilizers in, Iowa 769.
- variety tests, Ga.Coastal Plain 768.

Trypanosoma—

- cruzi* in California, 837.
- equiperdum* infection, resistance to, effect of copper, 389.
- sp., cultivation in vitro, 531.

Trypanosomiasis—

- American human, mammals as carriers, 531.
- animal and human, developments in treatment and in tsetse fly control, 383.
- bovine, in Hyderabad State, 693.

Trypsin—

- effect on tobacco mosaic virus, 643.
- inactivation by proteases, 294.

Trypsinogen, crystalline, isolation and conversion into crystalline trypsin, 582.

Tryptophan in soybeans, 5.

Tsetse fly as carrier of human and animal trypanosomiasis, 383.

Tuber moth situation, 654.

Tubercle bacilli—

- avian, cultivation and egg transmission, 107.
- avian, relation to tuberculosis in swine and cattle, 837.
- proteins, water-soluble, 150.
- survival time in soil, grass, etc., 533.
- variability, 383.

Tuberculariella ips n.sp., description, 212.

Tuberculin—

- studies, U.S.D.A. 528.
- testing of cattle, U.S.D.A. 528.

Tuberculosis—

- and abortion of bovines, simultaneous diagnosis, 254.
- and vitamin A deficiency of young children in India, 728.
- avian, in Hungary, Government combat, 538.
- avian, of sheep, 388.
- avian, problem in Middle West, 845.
- bovine, Calif. 689.
- bovine, diagnosis, precipitin test for, 694.
- bovine, in Great Britain, 255.
- eradication, U.S.D.A. 528.
- eradication in Nevada, 528.
- human and animal, interrelation, 691.
- in goats, 257.
- in poultry, reduction, U.S.D.A. 102.
- in swine and cattle, relation to avian bacilli, 837.
- in swine, types of bacilli in, 695.
- in wild deer, 383.
- of childhood, powdered whole milk as supplement to diet, 137.
- relation to deficiency of vitamins, 729.
- spontaneous, in a goat, 388.

Tuberculosis—Continued.

- spontaneous, in dogs, 390.
- survey among food handlers in New York City, 571.

Tularemia—

- epizootology, 838.
- in rodents as causal factor of human infection, 691.
- in sheep in Montana, 689.
- relation to wildlife populations, U.S.D.A. 500.

Tumors, frequency in mice, effect of vitamins A and D, 417.

Tung-oil trees, bronzing in, zinc sulfate for, Fla. 327.

Tupelo, white, of western Florida, 666.

Turf—

- botanical composition, effect of nitrogenous compounds, 607.
- brown patch, effect of temperature, 630.
- Pythium* disease, 631.

Turkey—

- eggs, hatchability and fertility, factors affecting, Nebr. 822.
- livers, vitamin A storage in, 87.

Turkeys—

- crooked breast bones, Wyo. 671.
- effect of eating *Crotalaria* seed, 391.
- inbreeding for egg production and growth, Calif. 671.
- nutritive requirements, [N.Y.]Cornell 823.
- occlusion of ceca, effect, 261.
- raising in confinement, Hawaii, 371.
- vitamin A deficiency in, Calif. 374.

Turnip clubroot resistance, 66; Wis. 489.

Turnips—

- swede, cause of bolting, 612.
- ultraviolet radiation for, Pa. 769.
- yields, Utah, 327.

Turpentine and rosin, U.S.D.A. 436.

Twinning in cattle, 463, 601.

Tylocladia fragariae, see Strawberry crown borer.*Typhlocyba australis*, notes, 362.*Typhlocyba pomaria*, see Apple leaf hopper, white.

Typhoid, avian, see Fowl typhoid.

Tyrosine and thyroxine, relationship, 437.

Tyrosine in soybeans, 5.

Udder—

- of cow, structure, Mo. 832.
- studies for development standards, U.S.D.A. 95.
- troubles, 242.

Ultraviolet—

- absorption spectra, determination method, 7.
- energy, solar, in Manila, 424.
- irradiation, effect on rachitic fowls, 828.
- irradiation unit, 7.
- light, action on ova of ascarids, 843.
- light, effect on hairless mice, 312.

Ultraviolet—Continued.

- radiation—
 - effect on seed germination and first vegetative period, 308.
 - effect on seedlings, 593.
 - solar, in Baltimore and Bogota, comparison, 283.
 - solar, measurement, 13.
 - transmission and antirachitic activation of milk films by, 245.
 - radiometry, solar, 423.
 - rays, effect on vitamin B, Mo. 564.
- Undernutrition—*see also* Diet deficiency and Malnutrition.
 - dietary treatment, 563.
- Understocks, *see* Rootstocks.
- Underwear, knit, properties of fabrics, 284.
- Undulant fever—
 - in Great Britain, 255.
 - laboratory diagnosis, 838.
- United States Department of Agriculture—
 - Bureau of Agricultural Economics, *see* Bureau of Agricultural Economics.
 - Bureau of Agricultural Engineering, *see* Bureau of Agricultural Engineering.
 - Bureau of Chemistry and Soils, *see* Bureau of Chemistry and Soils.
 - yearbook, U.S.D.A. 141.
- United States Weather Service, progress in development, 297.
- Urease—
 - action of polyhydric phenols on, 153.
 - activity, specific effects of buffers, 442.
- Urine—
 - effect on eggs and larvae of bursate nematodes in feces, 251.
 - human, vitamin C in, 568.
 - of normal and anemic persons, iron in, 877.
 - output of silicate in, 151.
 - pregnancy, and prolan, use in animal industry, 465.
 - pregnancy, effect on gestation in rabbits, 313.
 - pregnancy, extracts, responses of reproductive system to, 313.
- Uroboophilius* n.subg. taxonomy and morphology, 670.
- Urocystis*—
 - cephalae*, notes, [N.Y.]Cornell 788; Ohio 801.
 - occulta*, cytology, 489.
 - tritici*, notes, 349, 630.
- Uromyces*—
 - caladii*, relation to hosts, 638.
 - fallens*, notes, 351, 493.
 - spp. on Panicum, standing, 790.
- Uronic acids and vitamin C, comparison, Wis. 560.
- Ustilago*—
 - spp., comparative studies, 631.
 - tritici*, antiquity in California, 635.
 - zeae*—*see also* host plants.
 - mode of entrance into corn, 639.
- Utah Station, report, 429.

Utetheisa bella—

- on citrus and truck crops, Fla. 358.
- studies, S.C. 807.
- Vaccine and serum therapy, recent advances, treatise, 689.
- Vaccines, standardization, 102.
- Vacuoles of living cells, spontaneous contraction, 459.
- Vanilla extract, pure, use and source, 242.
- Vapo Dust for pest control, 360.
- Vegetable—
 - curly top in Pacific Northwest, U.S. D.A. 488.
 - insects on Long Island, N.Y.State 654.
 - oils, *see* Oils.
 - seeds, testing for viability and purity, N.Y.State 617.
 - weevil in Victoria, control, 513.
- Vegetables—
 - alkali- and cold-resistant qualities, Utah 327.
 - car-lot shipments and unloads, U.S. D.A. 860.
 - car-lot shipments, market distribution, U.S.D.A. 411.
 - cold storage, [N.Y.]Cornell 51.
 - color development in, [N.Y.]Cornell 770.
 - commercial drying methods, 868.
 - cooking by passage of an electric current through, Iowa 894.
 - description and classification, N.Y. State 617.
 - deterioration, prevention during freezing storage and subsequent thawing, Calif. 719.
 - effect of copper, boron, iodine, bromine, and arsenic mixture, Ky. 47.
 - fertilization, Pa. 769.
 - for Connecticut, testing, Conn.[New Haven] 429.
 - for quick freezing, N.Y.State 617.
 - fresh, grading and marketing standards, U.S.D.A. 121.
 - greenhouse, breeding and fertilization, Ohio 48.
 - growth and composition, effect of soil reaction, 182.
 - handling and storage, [N.Y.]Cornell 770.
 - Hawaiian-grown, iodine in, Hawaii 413.
 - New Jersey, New York market prices, N.J. 124.
 - of New York, N.Y.State 329.
 - preservation by quick freezing, N.Y. State 719.
 - production, factors in, Nebr. 769.
 - production on Long Island, [N.Y.]Cornell 476.
 - received in trucks at Columbus, Ohio, wholesale markets, 411.
 - seed decay and damping-off, control, N.J. 60.
 - shipments, straight and mixed carload, Tex. 554.

- Vegetables—Continued.**
 soil reaction for, [N.Y.]Cornell 770.
 spray residues on, 654.
 spring, production in lower Rio Grand-
 Valley, Tex. 328.
 storage for farm home, 117.
 tests, Utah 327.
 transplanting, 328.
 use of plant protectors and paper
 mulch for, Utah 327.
 varieties, Fla. 327; S.C. 769.
 variety tests, Ga.Coastal Plain 768;
 Nebr. 769; S.C. 769; W.Va. 617;
 Wyo. 617.
- Vegetation—see also Flora and Plants.**
 in France, relation to climate, 159.
 smoke injury from, nature, 490.
 type, climatic factors determining, 159.
- Velvetbeans—**
 culture experiments, Fla. 316.
 fertilizer experiments, Ga.Coastal
 Plain 757.
- Vent gleet in fowls, Mo. 528.**
- Venturia pyrina*, seasonal development,**
 [N.Y.]Cornell 788.
- Vermicularia capsici*, notes, Ga. 801.**
- Vermont Station publications, available, Vt.**
 429.
- Vermont Station, report, 142.**
- Vernalization—**
 experiments at Canberra, 607.
 studies, U.S.D.A. 605.
- Vertebrates, warm-blooded, popular account,**
 650.
- Verticillium—***
 alboatrum, notes, U.S.D.A. 195.
 dahliae on horseradish, control, 639.
 wilt of cotton in Greece, 346.
 wilt of eggplant, 497; N.J. 60.
 wilt of eggplant and tomato, seed
 transmission, 800.
- Vesicating beetle, life history and seasonal**
 abundance, 230.
- Vessels, fumigation with Carboxide, 360.**
- Vetch—**
 culture experiments, Ga.Coastal Plain
 757.
 culture in Imperial Valley, Calif. 34.
 fertilizer experiments, Fla. 316; Ga.
 Coastal Plain 757.
 hairy, imported seed, tests, 325.
 variety tests, Ga.Coastal Plain 757.
- Veterinary—see also Animal diseases.**
 helminthology and entomology, treatise,
 528.
 hygiene, treatise, 101.
 science, relation to animal breeding and
 public health, 249.
- Viburnum* galls, origin, 648.**
- Vim Oat Feed, studies, 517.**
- Vine weevil, black, notes, N.Y.State 654.**
- Vinegar—**
 byproducts, feeding value, U.S.D.A. 88.
 cider, making on farm, N.Y.State 158.
 wine, clarification, Calif. 735.
- Vines, frosted, treatment, Calif. 616.**
- Vineyard soils of Westfield area, [N.Y.]Cor-
 nell 15, 744.**
- Violets—**
 North American, chromosome relations
 and fertility in species hybrids, Vt.
 31.
 sweet, diseases, 631.
- Viosterol—see also Ergosterol, irradiated.**
 and parathyroid extract, effects of mod-
 erate doses, 889.
- Virginia College, notes, 736.**
- Virginia creeper leaf hopper, notes, Mont.**
 807.
- Virginia Polytechnic Institute, notes, 431.**
- Virginia Station, notes, 431, 736.**
- Vitamin A—**
 absorption spectrum, modifications in,
 154.
 and carotene—
 adsorption from digestive tract,
 effect of mineral oil, Pa. 879.
 in dairy feeds, 523.
 in nutrition of calves, 523.
 relation, 280.
 and carotenoids, relation to micro-or-
 ganisms, 442, 460.
 assay, 881.
 colorimetric determination, 584.
 concentrates, alleged toxic action, 565.
 deficiency—
 cutaneous manifestation, 419.
 effect on concentration of blood
 lipids, Ark. 883.
 effect on hematopoietic tissues of
 rats, Fla. 413.
 effect on mineral composition of
 rats, 417.
 in turkeys, Calif. 374.
 of barley for swine, Calif. 671.
 relation to ocular disturbances,
 726.
 relation to swine paralysis, 519.
 relation to tuberculosis, 728.
 destruction in foods, effect of hydro-
 genated, storage, and heated lard,
 Iowa 866.
 effect on keratomalacia, 728.
 effect on metabolism of animals, 418.
 formation in green plants, effect of
 micro-organisms, 517.
 importance for range cattle, Calif. 671.
 in alfalfa cut at different stages, 235.
 in alfalfa hay, effect of variety and cur-
 ing methods, Colo. 757.
 in apples, 880.
 in butter, effect of breed and diet of
 cows, 380.
 in butterfat from different breeds of
 cows, 523.
 in Chinese tangerine peel, 564.
 in eggs, N. J. 561.
 in eggs, relation to that in ration of
 hen, U.S.D.A. 560.
 in English butter, seasonal variation
 in, 685.
 in eye tissues, 280.

Vitamin A—Continued.

- in fish liver oils, 281.
 - in livers of human beings, 881.
 - in ox serum, 564.
 - in pasture plants, Idaho 137.
 - in salmon liver and egg oils, 880.
 - in solution, irradiation, production of substance A' in, 739.
 - in uncooked broccoli, Wis. 560.
 - in various feeds, N.J. 88.
 - massive doses, effects, 566, 881.
 - new color test for, 739.
 - plant pigments as sources, Fla. 413.
 - precursor, 7.
 - preventive action on tumors in mice, 417.
 - rations low in, ophthalmogenic properties, 418.
 - relation to colds, 281; W.Va. 728.
 - requirements of dairy cows, Tex. 244.
 - requirements of hens for egg production, Tex. 238.
 - research, effect of experimental technique, Iowa 866.
 - storage in cattle, 86.
 - storage in livers of turkeys and chickens, 87.
 - transformation from carotene in human body, 882.
 - value in dairy roughage, U.S.D.A. 95.
- Vitamin, antineuritic, *see* Vitamin B (B₁).
- Vitamin B (B₁)—**
- and thyroxin, Ark. 885.
 - B₂, B₃, B₄, B₅, and Y, review of literature, 566.
 - concentrate suitable for parenteral use, preparation, 443.
 - deficiency, effect of amount and composition of diet, 420.
 - deficiency, effect on nervous system, 884.
 - determination of potency, 566.
 - effect of ultraviolet rays, Mo. 564.
 - effect on respiratory quotient of brain tissue, 730.
 - human requirements, U.S.D.A. 564.
 - in alfalfa hay, effect of variety and curing methods, Colo. 757.
 - in Bosc pears, 727.
 - in cereal products and dried brewers' yeast, 138.
 - in milk, effect of pasteurization methods, 245; Pa. 879.
 - in muscle and liver of animals on different rations, Wis. 560.
 - in oriental radishes, Hawaii 413.
 - in rice, determinations, 282.
 - in rye, 88.
 - in uncooked broccoli, Wis. 560.
 - international standard, 884.
 - isolation from yeast, 154.
 - loss from organs of pigeons, effect of diets, 420.
 - new growth-promoting factor in whole wheat, 884.

Vitamin B (B₁)—Continued.

- supplements to high protein diets, effect on growth of rats, 419.
 - synthesis by ultraviolet irradiation of adenine sulfate, 585.
- Vitamin B₂, *see* Vitamin G.**
- Vitamin B₄ and new vitamin B growth-promoting factor, comparison, 884.**
- Vitamin B complex—**
- and lipoids, 729.
 - in apples, 880.
 - in Chinese tangerine peel, 564.
 - in ox serum, 564.
 - new factors in, 419.
- Vitamin C—**
- action on oxidation of tissues in vitro, 567.
 - and ascorbic acid, identity, 885.
 - and glutathione in crystalline lens, 283.
 - and uronic acids, comparison, Wis. 560.
 - color reactions for, 585.
 - deficiencies, detecting by capillary resistance, 422.
 - deficiency, relation to disturbances of reproduction and ovarian changes, 886.
 - effect on intracellular enzyme action, 586.
 - excretion in human urine, 568.
 - in apples, 880.
 - in apples, effect of storage in frozen state, 421.
 - in apples of Czechoslovakia compared with foreign fruits, 569.
 - in canned apples, 421.
 - in crystalline state, isolation, Wis. 560.
 - in fruits and vegetables, 282.
 - in grapefruit, effect of spraying, U.S.D.A. 564.
 - in guava, Hawaii 413.
 - in human tissues, 885.
 - in mice, origin, 421.
 - in milk, effect of pasteurization, 379.
 - in Netted Gem potatoes, Idaho 137.
 - in organs of rat, effect of fluorosis, 824.
 - in pineapple juice, fresh, Hawaii 413.
 - in potatoes of Czechoslovakia, 569.
 - in suprarenal medulla, 731.
 - in the hypophysis, 421.
 - in uncooked broccoli, Wis. 560.
 - isolation from vegetables, 586.
 - osazone, constitution, 585.
 - studies, 567.
 - synthesis by infants, 283.
 - urinary excretion, 422.
- Vitamin D—**
- and calcium in foods, 888.
 - and ergosterol, 732.
 - chemistry, 586.
 - crystalline form, historical review of investigations, 155.
 - depression of intestinal reduction, Iowa 822.
 - destruction in boiling fat, Wis. 560.
 - in blood and milk of cows fed irradiated yeast, 97.
 - in cacao shell, 888.

Vitamin D—Continued.

- in egg yolk, 522.
- in eggs, N.J. 561.
- in fish liver oils, two forms, 888.
- in four kinds of liver, U.S.D.A. 560.
- in green plants, 887.
- in milk products, 243.
- in salmon liver and egg oils, 880.
- in various feeds, N.J. 88.
- international standard, 887.
- milk production, irradiated yeast v. irradiated ergosterol for, 245.
- potency in milk, increasing, 242.
- preventive action on tumors in mice, 417.
- requirements of poultry, 238; Pa. 373; Wash. 92.
- Shear's aniline-hydrochloric acid reaction associated with, 587.
- synthetic and naturally occurring, differences, 586.
- third form, or D₃, 887, 888.
- treated puppies deprived of parathyroid gland, calcium and phosphorus metabolism, Wis. 559.

Vitamin E—

- bipartite nature of, 423.
- deficient diet, improved for female rats, 889.
- in dairy feeds, Nebr. 97.
- in legume seeds, 457.
- in soybean oil, 569.
- relation to sterility in dairy cows, Iowa 830.

Vitamin F, *see* Vitamin B (B₁).

Vitamin G—

- and pellagra-like dermatitis in rats, 282.
- assaying foods for, Munsell method, 727.
- complex, lactochrome as factor, [N.Y.] Cornell 823.
- deficiency, relation to ocular disturbances, 726.
- deficient diet, behavior of rats of different ages on, 730.
- deficient diet, cause of cataract, 730.
- deficient rats, dermatitis in, 566.
- heat stability, 585.
- in alfalfa hay, effect of variety and curing methods, Colo. 757.
- in Bosc pears, 727.
- in cereal products and dried brewers' yeast, 138.
- in dried skim milk, effect of processing, [N.Y.] Cornell 823.
- in eggs, N.J. 561.
- in milk, effect of pasteurization methods, 245; Pa. 879.
- in protein supplements to poultry rations, [N.Y.] Cornell 823.
- in rye, 88.
- in uncooked broccoli, Wis. 560.
- in various materials, comparison, 567.
- sparing action of fat on, 890.
- supplements for poultry, Calif. 671.

Vitamins—

- and natural pigments, 280.
- as they concern dairymen, 241, 242.
- biology, summary, 879.
- deficiency—*see also* Avitaminosis.
 - relation to tuberculosis, 729.
- fat-soluble, and antioxidants, association in plant tissues, 879.
- fat-soluble, in milk, recent developments, 242.
- fat-soluble, studies, 380.
- in canned tomatoes, Iowa 866.
- in eggs, effect of diet, Iowa 822.
- in nutrition, 413.
- localized, deficiencies, 418.
- purification, 584.
- spurious, swiss regulations, 137.
- standards, international, adoption in United States, U.S.D.A. 137.
- Vitula serratilineella*, *see* Fruit moth, dried.
- Vocational education, *see* Agricultural education, vocational.
- Voles, epidemic disease among, 804.
- Wagons, 3-horse hitch for, Mo. 539.
- Walking, energy cost, Mo. 515.
- Wallabies, Tasmanian, ticks fatal to, 670.
- Walls of concrete masonry units, fire resistance and strength, tests, 397.
- Walnut—
 - bacterial blight, control, Calif. 634.
 - canker, studies, W.Va. 635, 649.
 - husk fly, distribution and control, 230.
 - husk fly, life history and control, Calif. 654.
 - yellow, zinc sulfate against, Calif. 634.
- Walnuts—
 - black, planting experiments, Ark. 784.
 - cerambycid enemy of, 665.
 - of Rocky Mountain region, characteristics, habits, and distribution, U.S.D.A. 57.
 - Persian, pollination, U.S.D.A. 616.
 - spraying machinery, Calif. 700.
 - variety tests, Mo. 476.
- Warble fly in India, 229.
- Washington College, notes, 896.
- Washington Station, horticultural program, 331.
- Washington Station, notes, 896.
- Water—
 - absorption by plants, relation to soil moisture, 166.
 - action on lead, relation to drinking water, 547.
 - control upon flatlands of Florida Everglades, Fla. 393.
 - drinking, lead poisoning from, 547.
 - feed, purification, 243.
 - flow around bends in pipes, 110.
 - flow through standard cast-iron tees, loss of head in, 846.
 - for factory and farm use, treatment, 242.
 - ground, physical control and movement, 700.
 - ground, seepage, relation to alkali accumulation, Utah 111.

Water—Continued.

- hyacinth in Orissa, studies, 181.
- irrigation, *see* Irrigation.
- return, from Irrigation, policies governing ownership, U.S.D.A. 862.
- supplies in United States, industrial utility, 111.
- supply of Hawaii, 261.
- supply of United States, 1932, 111.
- treatment by heat and chemical disinfection, 117.
- underground storage, U.S.D.A. 699.
- well, quantity produced, effect of diameter, 539.

Waterfowl—

- ecology, Iowa 804.
- effect of eelgrass disappearance, U.S.D.A. 30.
- in 1934, status, U.S.D.A. 356.
- studies, U.S.D.A. 500.

Watermelon—

- anthracnose resistant strain, development, Iowa 787.
- diseases, Fla. 346.
- mosaic in Florida, 352.
- pests, Fla. 358.
- wilt fungus, W.Va. 635.
- wilt resistant strain, development, Calif. 616; Iowa 787.
- wilt resistant varieties, N.J. 60.

Watermelons—

- culture experiments, Ga.Coastal Plain 768.
- fertilization, Ark. 768; Ga.Coastal Plain 768.
- pollen germination and development, 773.
- production, labor requirements for an acre, Ark. 861.
- variety tests, Ga.Coastal Plain 768.

Weather—*see also* Meteorological observations and Meteorology.

- and plant diseases, U.S.D.A. 346.
- data, application to crop planning, 447.
- effect on wheat growth and yield, 298.
- forecasting, long-range, 589.
- forecasting, seasonal, methods, 447.
- of Ohio for forty-six years, Ohio 742.
- of world, relation to rainfall in China, 159.
- records, world, 160.
- relation to growth and quality of sugarcane, 159.
- relation to pollination of McIntosh apples, 186; N.H. 337.
- studies, U.S.D.A. 735.
- treatise, 158.

Webworms, sod, ecology and control, Iowa 806.

Weed seeds—

- germination and seed coat structure, Iowa 757.
- recovered in animal feces, percentage and viability, 474.
- viability, effect of digestive tract, Idaho 95.

Weeders, rod, efficiency, Idaho 110.

Weeds—

- aquatic, notes, 181.
- as carriers of nematodes on narcissi, U.S.D.A. 59.
- control, 475; Calif. 606.
- control with chemicals, Md. 46; N.Dak. 326.
- control with sodium chlorate, Idaho 35.
- control with tillage and chemicals, Utah 317.
- grass, of Nebraska, Nebr. 45.
- host range and overwintering of curly top virus, Calif. 348.
- in cereal crops, control, 475.
- water use in proportion to crops, U.S.D.A. 111.

Weigh tanks, fat test variations in, 524.

Welding, electric, principles, treatise, 263.

Wells, pollution and prevention, 117.

West Virginia Station, notes, 896.

West Virginia Station, report, 735.

West Virginia University, notes, 896.

Wheat—

- acreage, forecast of 1935, 855.
- and wheat milling products for growing chicks, Nebr. 822.
- as pasture crop, 319.
- black stem rust, quarantine against, U.S.D.A. 634.
- bounty and processing tax in Hungary, 711.
- bran and middlings, ground oats as substitute for chicks, 237.
- breeding, Ark. 756; Calif. 606; Idaho 34; Iowa 757; Mo. 466; N.J. 35; Nebr. 758; [N.Y.]Cornell 758; U.S.D.A. 605; W.Va. 606.
- breeding in Egypt, 180.
- bunt, *see* Wheat smut, stinking.
- certified seed production, rules and requirements for, N.J. 616.
- classification by reactions to carbolic acid, 44.
- composition and quality, effect of potassium, 615.
- composition, growth, and yield, relation to nitrogen, Wash. 473.
- cost of production, variations in, 266.
- cross, genes differentiating habit of growth, nature and interaction, 472.
- cross resistance to bunt and leaf rust, inheritance, 492.
- crosses, endosperm development and plant type, relation, 600.
- culture experiments, Ga.Coastal Plain 757; Nebr. 758.
- culture in Imperial Valley, Calif. 34.
- disease resistant varieties from Russia, 630.
- diseases in Arizona, key, Ariz. 346.
- effect of legumes in rotation, Ky. 35.
- effect of nitrogen forms on growth and nitrogen content, 761.

Wheat—Continued.

- effect of previous soil treatment with ammonium thiocyanate and sodium chlorate, N.H. 475.
- experiments, Utah 317.
- feeding to lambs, Nebr. 822.
- feeding value, Idaho 825.
- fertilizer experiments, 35; Idaho 35.
- flag smut, resistance and control, 349.
- floral organs, development, effect of unfavorable temperatures, 456.
- flour, *see* Flour.
- foot and root rots in Australia, 644.
- foot rot, Columbia Basin, control, U.S.D.A. 633.
- foot rot, studies, 491, 644.
- forced culture, importance of winter cryptovegetation, 596.
- germ, vitamins B and G in, 138.
- germinated, effect on flour, U.S.D.A. 436.
- Gibberella* disease, symptoms, 789.
- grades purchased from farmers' cooperative grain elevators, Okla. 707.
- grown in aqueous culture media, variation of protein quality, 473.
- grown in liquid media, effect of nitrate salts on bread scores, 473.
- growth and yield, effect of weather, 298.
- growth during heading period, 614.
- hard red spring, carotenoid content, 615.
- hessian fly resistant varieties, Mo. 501.
- high v. low calcium- and phosphorus-carrying, nutritive value, Utah 413.
- hybrid vigor in, 767.
- hybrids, carotene and other quality characters in, 325.
- in mixtures, baking properties, 181.
- infection by *Urocystis tritici*, 630.
- insect survey, annual, in Ohio, Ohio 218.
- insects affecting, 359.
- irrigation water application, critical period, Colo. 767.
- jointworm in Ohio, Ohio 218.
- leaf rust, studies, U.S.D.A. 61.
- leaf tissues normally resistant to leaf rust, effect of mildew infection, 645.
- lodging, 325.
- loose smut, control, 793.
- low smut on Turkey type wheats, U.S.D.A. 195.
- meadow v. fallow for, 35.
- midge in Ohio, Ohio 218.
- milling quality, relation to weight per bushel, 180.
- nitrate utilization, effect of shorter light rays, Wis. 456.
- pest, new, in Ohio, Ohio 233.
- planting tests, Colo. 757.
- plants, individual, weight per bushel of grain from, determination, 615.
- pollen mother-cells, segregation of heteromorphic homologous chromosomes in, 169.

Wheat—Continued.

- powdery mildew, inheritance of resistance to, 793.
- prices and index numbers, Mich. 124.
- production control program, support by farmer, U.S.D.A. 118.
- production, development and probable future, 708.
- quality, damage to, 204.
- quality, effects of nutrients and soil conditions, Calif. 606.
- recumbence, effect of light and soil surface, 614.
- research at Dominion Grain Research Laboratory, 45.
- resistance to rusts and smuts, U.S.D.A. 633.
- rotation experiments, U.S.D.A. 759.
- rusted and sound, successive weight determinations, 203.
- rust-resistant, development, Calif. 634.
- rusts—*see also* Wheat leaf rust, Wheat stem rust, and Rusts.
 - varietal resistance to, 793.
- seed infections and treatment, Iowa 788.
- seedling blight, effect of combined action of *Fusarium culmorum* and *Urocystis tritici*, 644.
- seedlings, deformation as index of flag smut or bunt infection, 199.
- seedlings, effect of ethylene, factors in, 594.
- seedlings, effect of X-rays, 457.
- selenium injury and inhibition by sulfur, 203.
- situation, Okla. 401, 707.
- smut—*see also* Grain smuts and Smuts.
 - control, relation to soil infestation, Idaho 60.
 - infection, seedling deformation as index, 199.
 - resistance, physiologic forms, Utah 347.
 - resistant, development, Calif. 634.
- smut, stinking—
 - effectiveness of Davlitini, 644.
 - effects on plant and treatment, 644.
 - in Argentina, 61.
 - physiologic specialization in Kansas, 793.
- spring, culture experiments, Wyo. 606.
- spring, disease resistance in, correlated inheritance, 601.
- spring, variety tests, Idaho 34; Nebr. 758; U.S.D.A. 759; Utah 316; Wyo. 606.
- spring, yield, relation to awns, 180.
- stem maggot injury, 816.
- stem maggot, susceptible varieties, 615.
- stem rust—*see also* Wheat leaf rust, Wheat rust, and Rusts.
 - development in absence of alternate host, Nebr. 788.
 - resistance, 631.
 - white pycnia and aecia of, 638.
- stem sawfly, black, in Ohio, Ohio 233.

Wheat—Continued.

straw, changes in, effect of composting, 302.

take-all, whiteheads in, development, 350.

tillering, relation between depth of node and cold resistance, 44.

trading commissions in Spain, 857.

under the Agricultural Adjustment Act, 268.

varieties—

English, classification and development, 767.

improved, registration, 767.

test weight and flour yielding capacity, 180.

water economy and growth, effect of leaf rust, 631.

winter hardiness, Idaho 35.

variety-cultural experiments, Iowa 757.

variety-date-of-seeding test, Mo. 466.

variety tests, Ark. 756; Ga.Coastal

Plain 757; Iowa 757; Ky. 35; Mo.

466; N.J. 35; U.S.D.A. 605.

vernalization experiments, 607; U.S. D.A. 325.

winter, culture experiments, Wyo. 606.

winter, effect of various smut treatments, 180.

winter, foot rot disease, U.S.D.A. 791.

winter, speeding-up of development and growing in hothouse, 596.

winter, studies, 474.

winter, varieties, inheritance of quality, 600.

winter, variety tests, Idaho 34; Ind.

35; Nebr. 758; Utah 316; Wyo. 606.

world supplies and requirements, 861.

yield and protein in, relation, 473.

yield in fifty-sixth year of continuous culture, 36.

yields, Ind. 35.

Wheatgrass—

bluestem, depth of planting, Utah 317.

crested, adaptation in Western Canada, 181.

crested, data, U.S.D.A. 181.

crested, in northern Great Plains pastures, U.S.D.A. 34.

Whey—

dried, manufacture, composition, and use for feed, U.S.D.A. 832.

protein for use in infant feeding, removal of salts from, 523.

utilization, U.S.D.A. 436.

v. skim milk for pigs on pasture, Wis. 515.

Whisky, repeal, analyses, Conn.[New Haven] 130.

White ants, *see* Termites.

White grub parasites in Puerto Rico, 655.

White grubs—

in Quebec, control, 231.

studies, Iowa 806; U.S.D.A. 653; Wis. 501.

White pine—

blister rust—

control, U.S.D.A. 633, 634.

5-needled species of pine and forms of *Ribes* susceptible to, 71.

in British Columbia, 72.

in Iowa, control, Iowa 788.

quarantine against, U.S.D.A. 634.

spread, relation to seasonal development of *Ribes*, 71.

seedlings, germination and development, effect of soil temperature, Vt. 55.

seeds, germination, effect of after-ripening, 487.

survival and growth, effect of weeding, 487.

western, infection by blister rust, 72.

Whiteflies—

lime-sulfur as control, Fla. 358.

of Egypt, 659, 812.

on oranges, effect of arsenical and copper insecticides on natural control, 220.

transmission of curl and crinkle diseases of tobacco, 799.

Whitetop control, 476; Idaho 35.

Wildlife—

conservation, U.S.D.A. 650.

protection, directory of officials for, U.S.D.A. 650.

Willow—

pests at Syston, Leicestershire, 808.

scale, population density and egg production, 217.

Willows of Rocky Mountain region, characteristics, habits, and distribution, U.S.D.A. 57.

Wind—

effect on carbon dioxide concentration in air, 588.

force, Beaufort scale, improved form, 57.

pressures on buildings, 398.

velocity, daily forecasting for tobacco growers, 298.

Windbreaks, *see* Trees, windbreak.

Wine making problems, Calif. 735.

Winnowing machine, new type for separating grain and bhoosa, 265.

Winter temperatures, 1933-34, in Alaska, 13.

Wireworms—

injuries to potatoes, [N.Y.] Cornell 807.

larval instars and stadia, 231.

occurrence and control, Pa. 807.

studies, U.S.D.A. 653.

Wisconsin Station, notes, 576.

Wisconsin Station, report, 574.

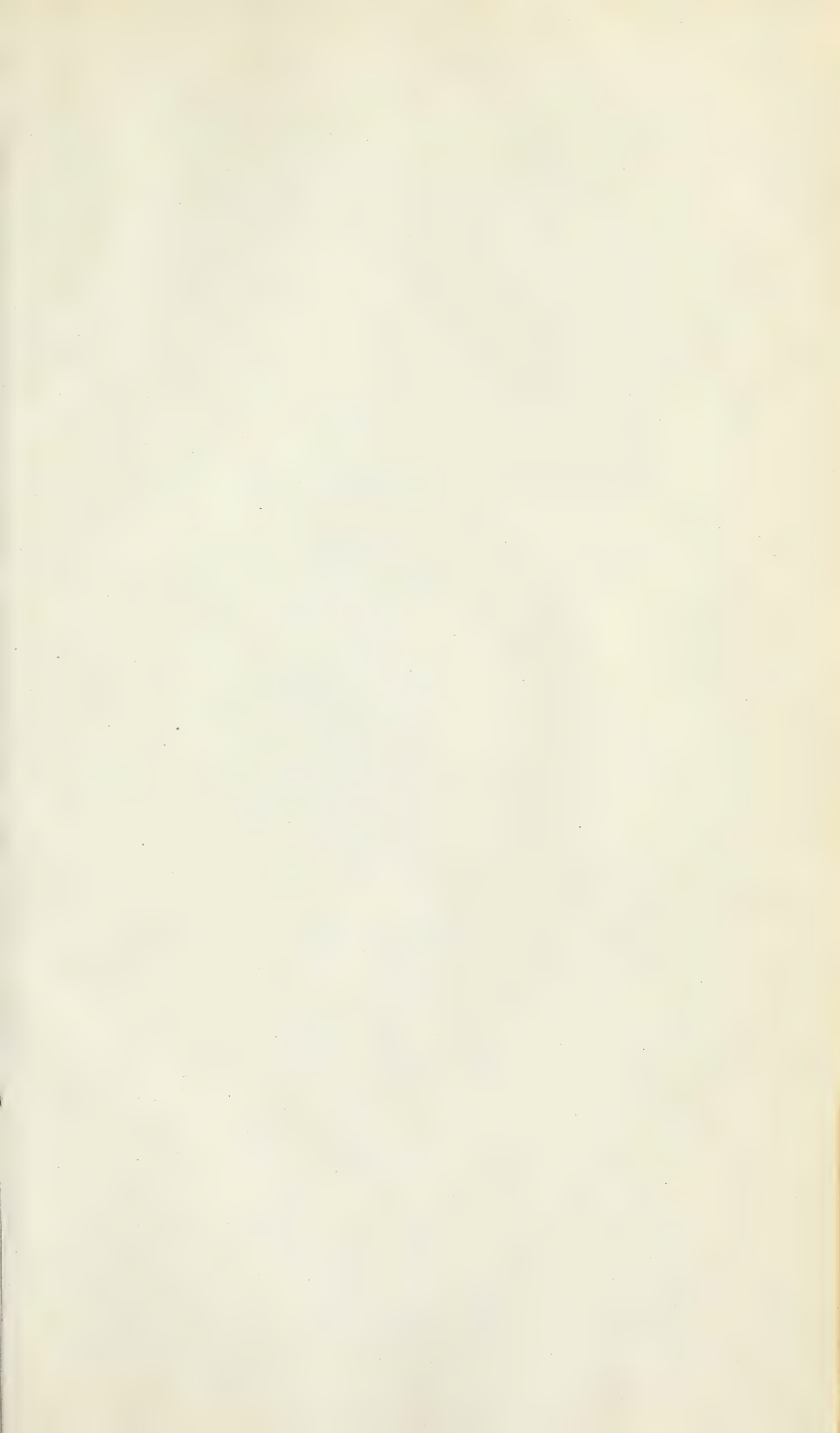
Wisconsin University, notes, 576.

Women—

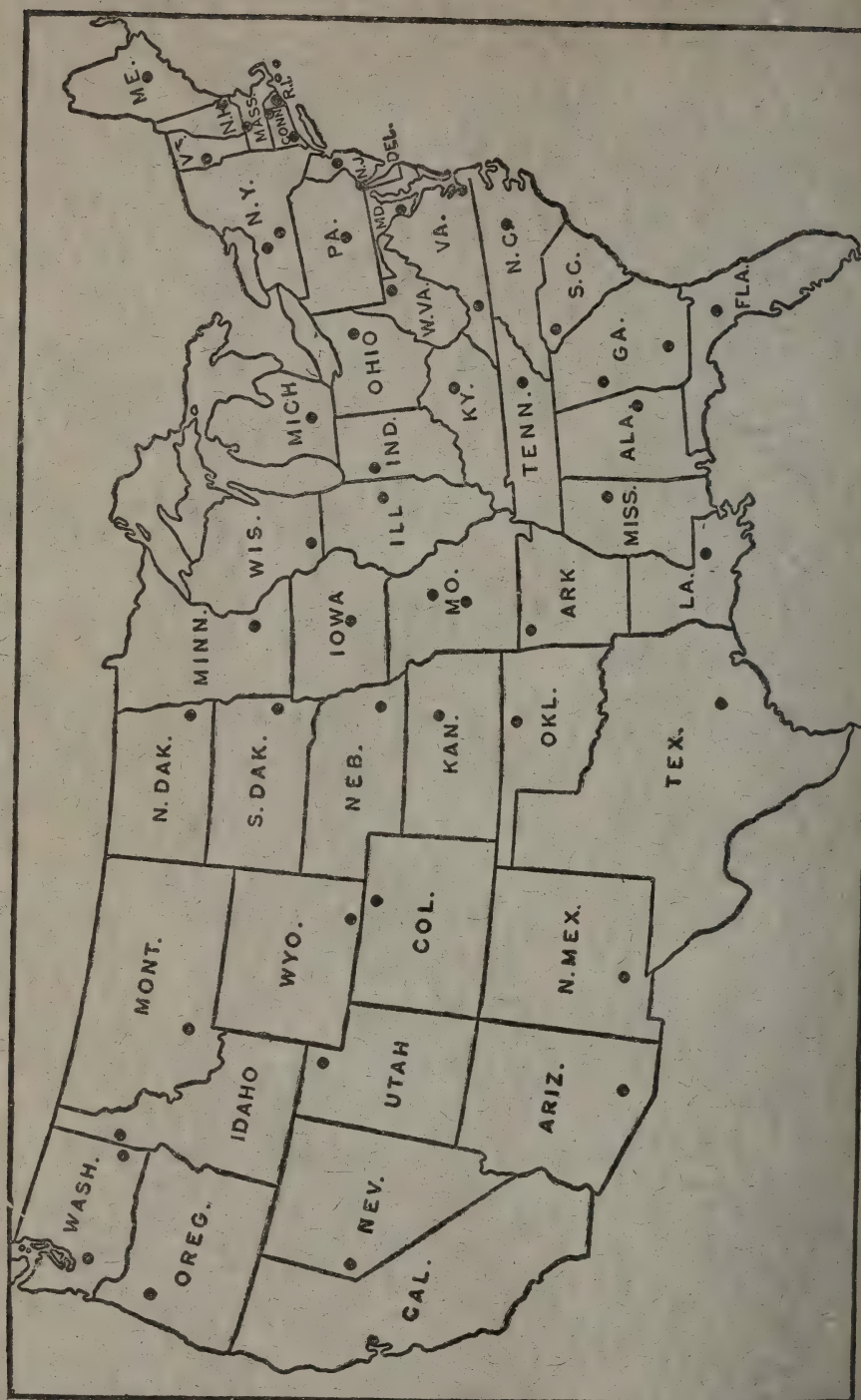
college, protein, calcium, and phosphorus intakes, 416.

old, basal metabolism, 416.

- Wood—*see also* Lumber and Timber.
 bending, U.S.D.A. 543.
 digestion by insects, and role of micro-organisms, 500.
 durability and specific gravity, relationship, 345.
 growth, structure, and identification, publications on, U.S.D.A. 629.
 joints, protection against decay and stain, 701.
 lice, dipterous parasites, 229.
 pests, 217.
 Woodgate rust, quarantine against, U.S.D.A. 634.
 Woodlots, farm—
 timber from, new markets in Pacific Northwest, U.S.D.A. 55.
 value for forage, U.S.D.A. 55.
 Woodpecker, great spotted, crossbill, and squirrel, mutual relations, 651.
 Woody plants—
 broad-leaved, suction force in, 595.
 symbiosis, parasites and inheritance of pathological characteristics, 70, 71.
 winter transpiration, relation to geographic distribution, 751.
 Woody twig, structural changes after summer pruning, 53.
 Wool—
 and other fibers, studies, U.S.D.A. 572.
 blankets, wearing qualities, tests, U.S.D.A. 572.
 fibers, pulling out, effect on hairiness, 518.
 growing, income from, Pa. 855.
 growth and characteristics, effect of rations, Okla. 517.
 methionine in, 441.
 growth and index numbers, Mich. 124.
 production, development and probable future, 708.
 quality, factors in, 91.
 research at Wyoming Station, Wyo. 733.
 yield and fleece density, measurement, simplified method, U.S.D.A. 139.
 Woolly aphid, *see* Apple aphid, woolly.
 Worms in children, effect of diet, Fla. 413.
 Wyoming Station, notes, 736.
 Wyoming Station, report, 735.
 Wyoming University, notes, 736.
 Xenia and metaxenia in apples, 462.
 Xenia and metaxenia in Bartlett pears, 338.
Xenopsylla cheopis, *see* Rat flea, oriental.
 Xerophthalmia, experimental, effect of carbohydrates, 883.
Xestobium rufovillosum, life history, 232.
 X-ray—
 diffraction patterns of cellulose particles, 292.
 X-ray—Continued.
 treatment of ovaries, effect on subsequent pregnancies, 604.
 X-rays—
 application to research in dairy products, 682.
 effect on development of sex characters in cockerels, 679.
 effect on germination of pecans, 484.
 effect on growth and respiration of wheat seedlings, 457.
Xylopsocus capucinus, pest of stored derris, 817.
 Xylose administration, effect on blood sugar, 724.
Xylotrechus quadripes in Mysore, 368.
 Yam beans, tests, P.R. 174.
 Yams, variety tests, P.R. 174, 182.
 Yautias, variety tests, P.R. 174.
 Yeast—
 byproducts, feeding value, U.S.D.A. 88.
 consumption, effect on vitamins in human milk, 727.
 effect on growth of rats on high fat diet, 282.
 fermentation, carbon dioxide production rate during, determination, 294.
 hetero-auxin isolation from, 597.
 irradiated, fed to cows, effect, 97.
 irradiated, v. irradiated ergosterol for vitamin D milk production, 245.
 proteolytic enzymes, 154.
 therapeutic value, 722.
 Yeasts—
 dissociation in, Mich. 286.
 growth, change in pH of medium by, 524.
 growth, effect of oxidation-reduction potential of medium, 524.
 Yellow fever virus, transmission experiments by dog fleas, 531.
 Youngberries—
 cane failure in, control, Calif. 616.
 frozen, and use for wine making, U.S.D.A. 436.
Zeuzera pyrina, *see* Leopard moth.
 Zinc—
 chloride for soil treatment of termites, 506.
 chloride treated wood, painting characteristics, 543.
 oxide for damping-off treatment, N.Y. State 791.
 role in nutrition of rats, Wis. 560.
 sulfate as soil amendment in citrus groves, 781.
 sulfate for pecan rosette control, 648.
 sulfate in spray mixture, value, U.S.D.A. 59.



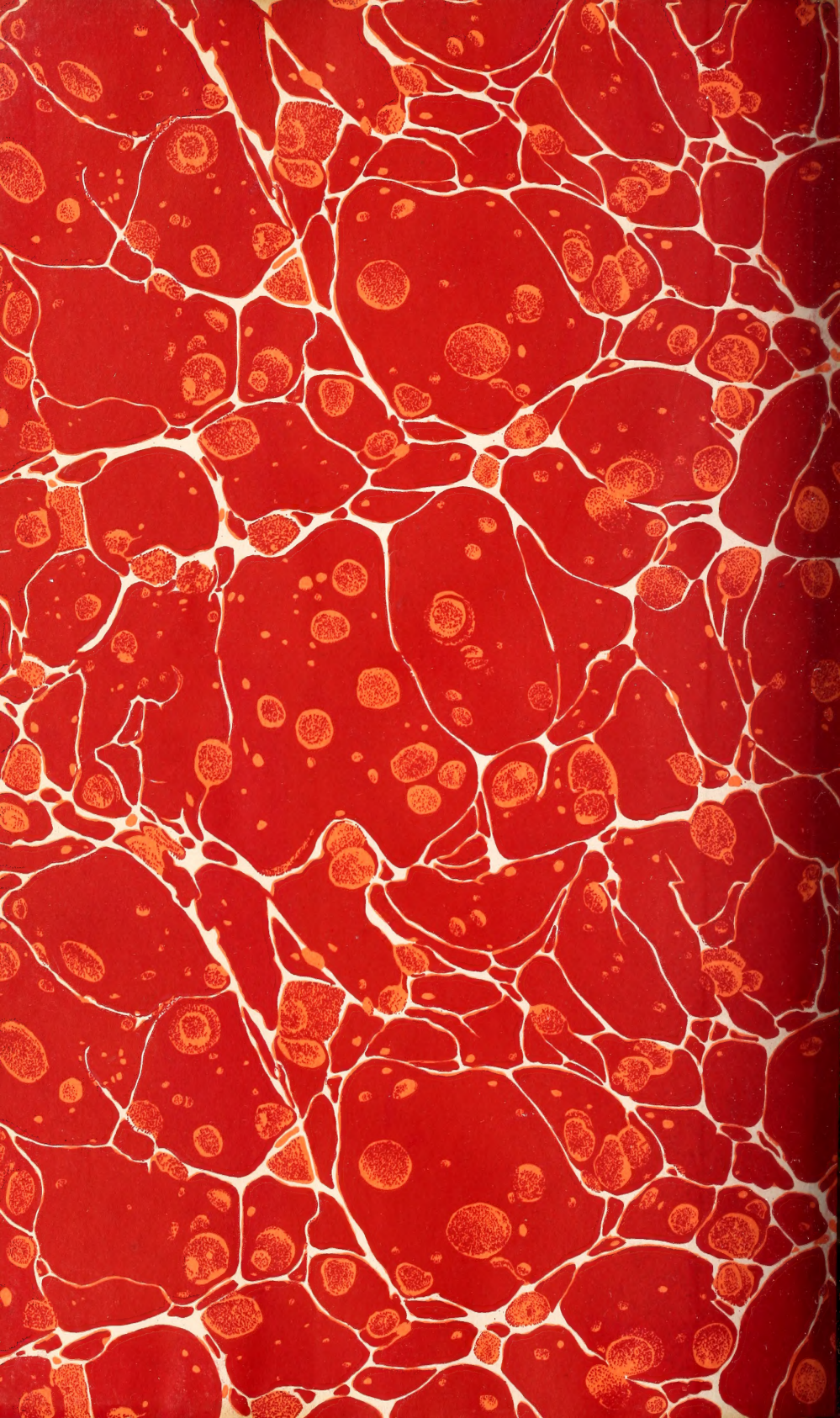




THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES







1		U. S.
EXGR		EX
AUG 7 th		1937
AUG 6		AUG 6

ofo 8-2432



